

THE IRON AGE

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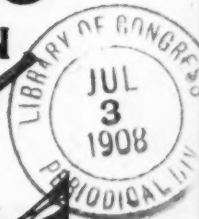
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See page 58

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THE IRON AGE

New York, Thursday, July 2, 1908.

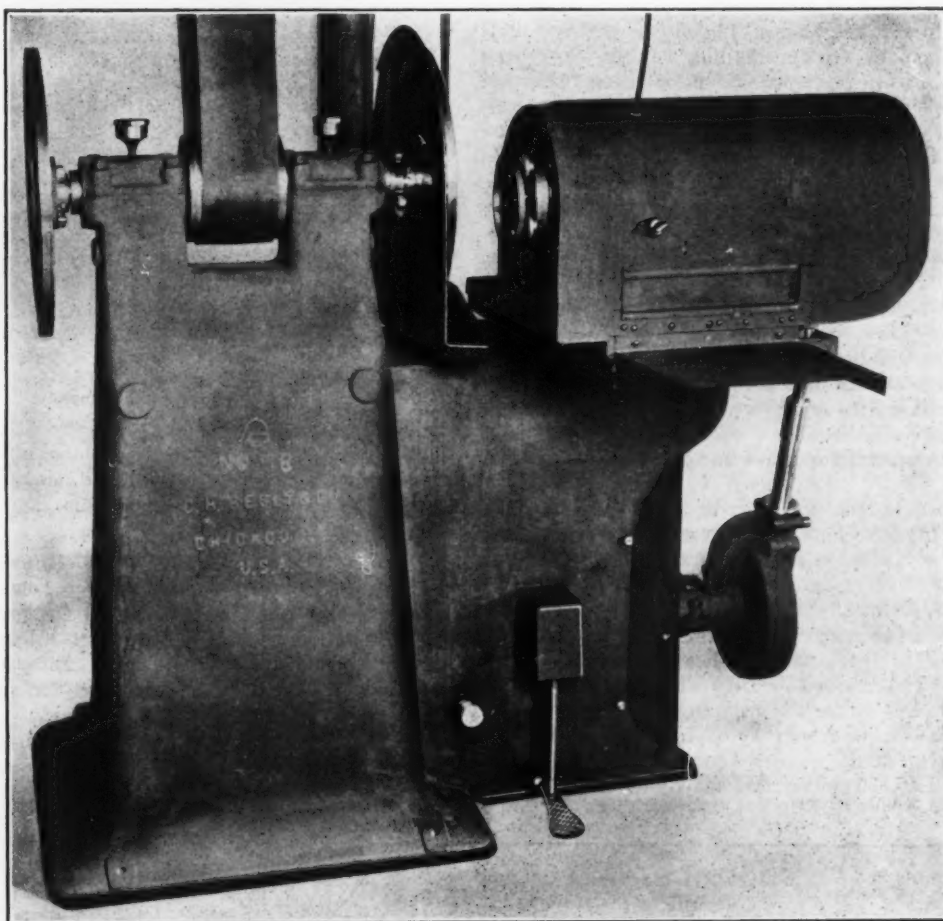
The Besly No. 18 Piston Ring Grinder.

For grinding the sides of piston rings rapidly and accurately to size, Charles H. Besly & Co., 15-21 South Clinton street, Chicago, Ill., have designed a new type of grinding machine shown in the illustration herewith. The novel feature of this machine is that the grinding is done on a steel disk wheel, which has its sides covered with Helmet spiral abrasive disks, which are manufactured exclusively by the builders. This machine will grind rings from the smallest diameter up to 10 in. diameter very rapidly and accurately.

The machine as shown carries 18-in. disk wheels. The spindle is $1\frac{3}{4}$ in. diameter by 25.9-16 in. long, and is made of crucible machinery steel. The bearing bushings are 8

through a crank and lever, the crank being attached to a lower shaft, which is in turn driven by a spur gear meshing a gear on a worm gear shaft. The latter shaft is driven by a worm on a shaft, which is placed in the lower part of the base at right angles to the spindle, and projects at the rear, where it carries a pulley driven direct from the countershaft by a quarter-turn belt. On the worm gear shaft is mounted a clutch which when engaged causes this shaft to make four revolutions and then releases automatically. The four revolutions are sufficient to produce a forward and return movement of the platen head.

On the platen is mounted a compound slide which also has a reciprocating motion, but perpendicular to the face of the disk wheel. This slide receives its motion



The No. 18 Piston Ring Grinder Built by Charles H. Besly & Co., Chicago, Ill.

in. long and are fitted in bored holes in the base casting, thus insuring perfect alignment, as well as making it easy to replace them when worn out. The bushings are split and the base has removable caps over the bushings, facilitating removing the spindle when necessary. End adjustment of the spindle is accomplished by means of a threaded collar, which is mounted on the spindle just under the flange of the spindle pulley. The end thrust is taken on hardened and ground steel thrust collars of large area. The bearings are well protected from dirt and grit, and particular attention has been given the lubricating of all bearing parts. The spindle pulley is 7 in. diameter and is driven by a 6-in. belt.

On the right side of the machine and secured to the bed is a dove-tailed bed plate, on which is mounted a platen or carriage. This platen has a reciprocating motion parallel to the face of the disk wheel, effected through a gear and rack underneath the bed. This gear is driven

from a cam, which is secured to the outer edge of the bed plate. On the slide is mounted the head or bearings of a spindle which carries a chuck for holding the work to be ground. This head can be moved back and forth through a screw and hand wheel. The screw has a micrometer dial graduated to thousandths of an inch and governs the distance of the chuck from the face of the disk wheel. The chuck is a magnetic rotating one, driven through bevel and spur gears from a shaft in the base of the machine. Through a sliding gear in the base a rapid or slow motion can be obtained across the face of the disk wheel.

The operation of the machine is as follows: The work is placed in the chuck and the lever is tripped, causing the platen to move forward; the chuck carrying the work moves toward the face of the grinding disk and the rotating work comes in contact with the grinding disk, and instead of grinding in one place only, the whole

face of the work is ground at once. As soon as the platen makes its full forward stroke it recedes, and near the end of the latter stroke the chuck carrying the work also recedes from the face of the grinding disk. As soon as the full backward stroke is made the platen and chuck stop automatically. The working parts are thoroughly encased and protected from dust and grit, as can be seen in the engraving.

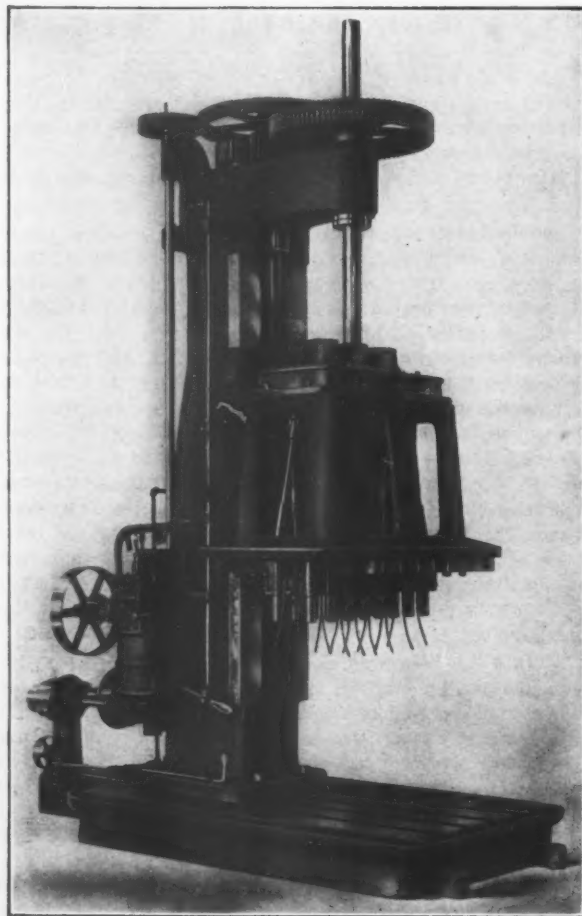
The height of the machine from the floor to the center of the spindle is 42 in., the floor space occupied 30 x 48 in. and the complete weight 3000 lb.

Baush Special Multiple Drills.

The multiple spindle drilling machines shown in the illustrations are two special types installed at the plant of the Bethlehem Steel Company, South Bethlehem, Pa., and constituting a part of the equipment of the mill for manufacturing the new Bethlehem structural steel sections under the Grey process. The group consists of eight double head horizontal and four single head vertical drilling machines arranged in a line, with every other machine on a sliding base, to accommodate the drilling of any required length of steel. The double head horizontal machines are for drilling flanges, each head sustaining the drilling pressure of its opposite. The vertical machines are for drilling the web. This arrangement permits of the necessary drilling with the minimum handling of the work. These machines were designed and built for this special purpose by the Baush Machine Tool Company, Springfield, Mass., and embody the standard features of the company's line of this class of tools.

The double head horizontal machines are in two sizes, one carrying 12 x 48 in. heads and the adjustable spindles covering any layout within that rectangle. Each head has 18 drill spindles. The other size carries 12 x 24 in. heads, with 10 spindles to each head. The heads can be operated independently or together as desired. The vertical machines are also in two sizes, one carrying 16 drill spindles on its single head in a working rectangle of 12 x 36 in., and the other 10 spindles in a rectangle of 12 x 24 in.

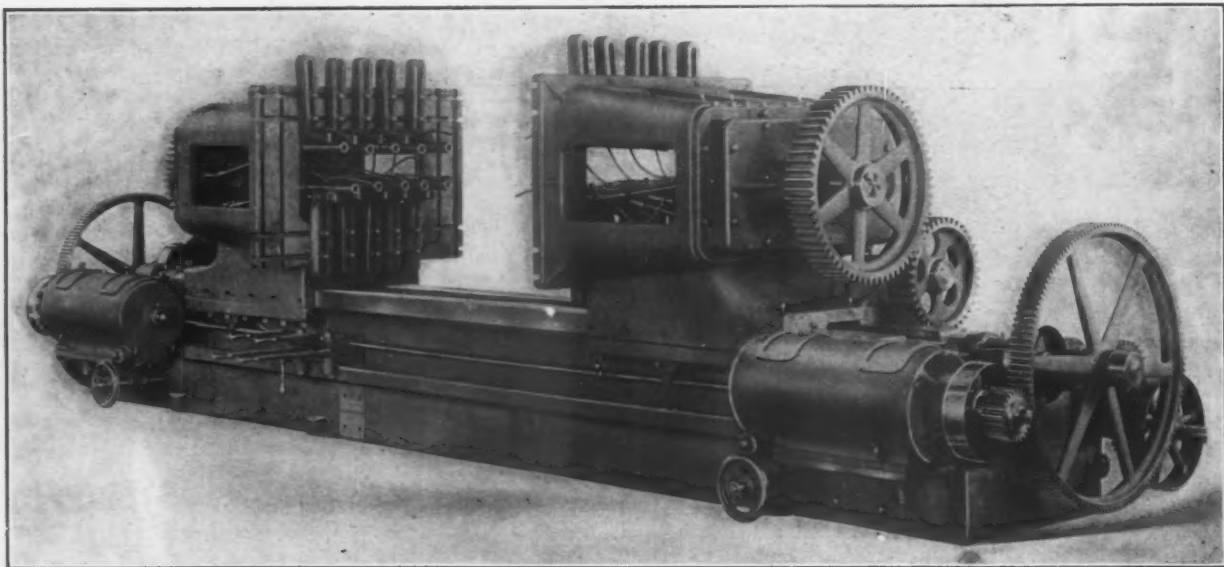
All spindles in the entire group of machines have No. 3 Morse taper sockets, and are designed for drilling 1-in. holes in soft steel at a speed of 55 ft. per minute at the periphery of the drill, with ranges of feed up to 0.01 in. per revolution of the spindle. Each head is equipped with a two-speed quick return of the drill heads. In both types of machine each head is independently driven by a variable speed motor, and each movable machine has an extra motor for adjusting its position. The 18-spindle heads are driven by 25-hp. motors, the 16-spindle heads by 20-hp. motors and the 10-spindle heads by 15-hp. motors. The vertical machines weigh about



A Vertical Single-Head Baush Multiple Drill, Also Built for the Bethlehem Steel Company.

11,000 lb. and the horizontal machines about 25,000 lb., exclusive of the motors. Each head has an oil pump, pan reservoir and connections to spindles to allow of lubricating each drill.

Arrangements have been perfected by the Droege, owners of the Licking Rolling Mill Company, Covington, Ky., which has been in a state of litigation for some time, to resume within 30 days. Bids are now being taken on the repairs necessary and for some minor details of construction. The mill has been idle since February 6, when fire destroyed the central portion of the structure. Fred Droege will be the president of the re-organized company.



Double-Head Horizontal Multiple Spindle Drilling Machine Built for the Bethlehem Steel Company by the Baush Machine Tool Company, Springfield, Mass.

The New Gould & Eberhardt Stocking Cutter.

Accurate and noiseless running gearing is much sought and special machines and accessories for producing them are being continually developed and perfected. In machines using the rotary milling or disk cutter it is considered by some advisable to first rough out the teeth with a roughing-out or stocking cutter before finishing.

Some five or six years ago, Gould & Eberhardt, Newark, N. J., brought out what they term their stepped style of stocking cutter for roughing out the teeth of coarse pitch gearing, preparatory to finishing with a standard finishing cutter. The advantages claimed over the ordinary square saw or slotting cutter which had previously been used most generally in this country, was that by having the steps in the cutter the chips were broken up, and consequently less power was consumed and the strain on the machine and parts was not so great as with the old style of cutter, the principle of which produces a long shearing cut, with its incidental disadvantages. Again, the lower step of the cutter takes away the wide flank of the gear tooth space, which the square stocking or slotting cutter did not do, and in this way it left a more nearly uniform amount of metal all around for the finishing cutter to take out.

While the idea was not new at the time this cutter was put on the market, this firm claims the credit for first exploiting and marketing it in this country. Since then the cutter has been still further improved, and recently the new stepped style of stocking cutter, shown in Fig. 1, was patented. The essential difference between this and the older stepped cutter is the recessing of the tops of the cutting teeth, so that each tooth practically takes out about half as much as before, as shown in Fig. 2. The new stocking cutter also finishes the bottom of the tooth space, thereby relieving the finishing cutter of this work, and saving it where it usually wears out first. Finishing cutters with these new features can also be furnished.

The principal claims for the new cutter are that a maximum amount of stock is removed with a minimum amount of power consumption; that the cutting edges being staggered are more thoroughly lubricated while cutting; that they save the finishing cutters by removing the stock where the ordinary saw cutter leaves large corners at the points of the gear teeth, and that they are considerably wider through the hubs than a saw or slotting cutter, lessening the liability for keys to shear off.



Fig. 1.—The New Stocking Cutter for Cutting Gears, Made by Gould & Eberhardt, Newark, N. J.

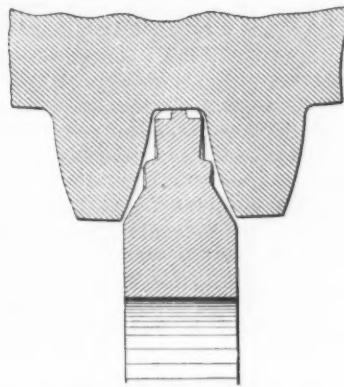


Fig. 2.—Detail Illustrating the Action of the New Gould & Eberhardt Stocking Cutter.

and in consequence of all of the above permit of faster feeds and speeds being used, and at the same time lessen considerably the strains on the machine itself.

Business Men to Be Columbia Teachers.

Some leading men in the manufacturing world will appear at Columbia University, New York, as lecturers in the engineering schools at the next session. For some time there have been occasional lectures by such men on special subjects, but their design has been rather to stimulate the students than to give them systematic instruction. The new scheme aims at an addition to the course by a regular series of lectures given by men actively engaged in business, with the definite idea of bringing the university into touch with the requirements of everyday life, and to teach students how not only a result may be obtained theoretically, but how it may be reached with the utmost economy.

In pursuance of the general plan arrangements have been made by Dean Frederick A. Goetz and Prof. Charles E. Lucke, head of the Department of Mechanical Engineering, assisted by Charles B. Goins, editor of the *Engineering Magazine*, to secure men of the highest reputations as practical engineers to deliver courses at Columbia next fall on engineering. Among the men who will become for the nonce university lecturers are James M. Dodge, president of the Link-Belt Company, who will describe the different kinds of conveying machinery; Charles U. Carpenter, president of the Herring-Hall-Marvin Company, who, as well as Mr. Goins, will give his experience of the management of works; James Newton Gunne, who is one of the foremost authorities on shop costs and processes; Richard T. Lingley, who will unravel to the students the mysteries of the accounts of works, and Harrington Emerson, who is down for a course on shop efficiency.

Special types of machines will be explained by leading authorities, such as William P. White, who has designed the largest water turbines in this country; Frederick W. O'Neil of the Nordberg Mfg. Company, who will discuss air machinery, and Frederick Ophuls, manager of the De La Vergne Machinery Company, refrigerating machinery.

The puddling mill to be erected by A. M. Byers & Co., Inc., at Girard, Ohio, will require considerable new equipment. The plant will contain 40 puddling furnaces and two finishing mills. The building for the latter is to be 102 x 300 ft. and the building to contain the puddling furnaces will be 80 x 408 ft., both of steel construction, with corrugated steel siding. Increased power will be needed for the new plant, and the firm is in the market for ten 125 hp. boilers and a 750 hp. engine. A 16-in. three-high roughing mill and a 12-in. three-high finishing mill, squeezers, &c., will also be required.

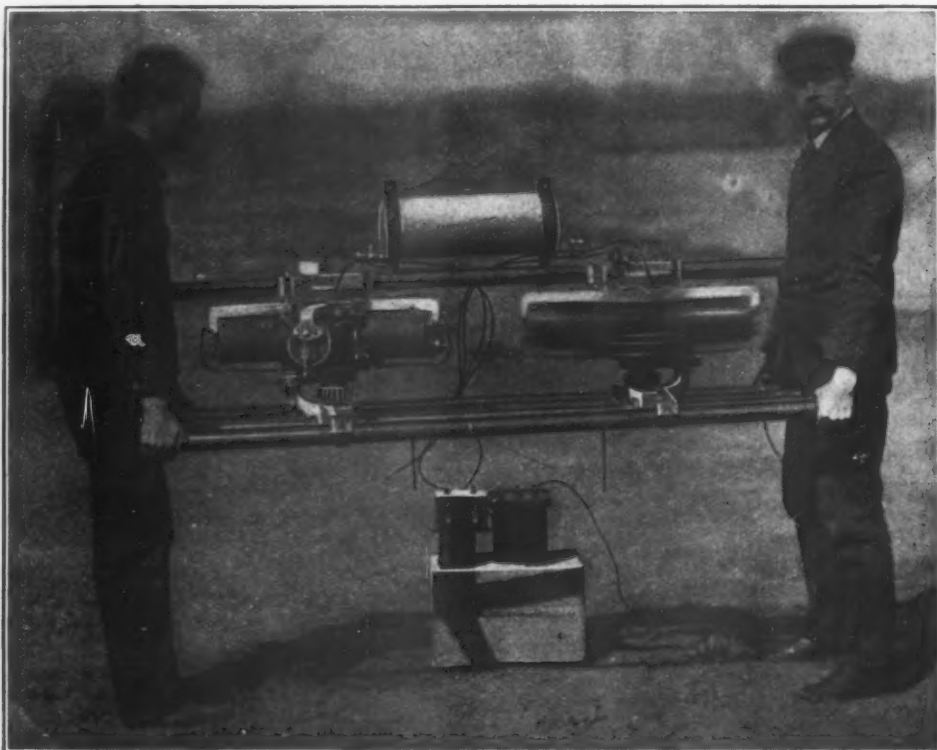
The Rockdale Iron Company's furnace at Rockdale, Tenn., which has been on foundry iron, was changed to ferrophosphorus on July 1. It is reported that some good business has been booked for the latter product.

The Farwell Aeronautic Motor.

What is claimed to be the lightest motor of its power ever constructed, is that designed by F. O. Farwell and built by the Adams Company, Dubuque, Iowa, particularly for propelling airships. The illustration shows two of these motors, one running and the other stationary. To demonstrate the lightness and steadiness, they were held by two men while the photograph was taken. The weight, including timer, float feed carburetor, automatic force feed oil pump and oil tank, is only 97¼ lb. for 36 hp., or 2.7 lb. per horsepower. The single throw crankshaft, weighing only 4½ lb., is stationary, and the five 4¼ x 3½ in. cylinders set 72 degrees apart revolve around it and up to 1800 rev. per min., producing a gyroscopic action which is of value in an airship to steady its flight. Other novel features are that the motor has no flywheel, no reciprocating parts, no muffler and no cooling device, that the valves, 10 in number, are actuated by a single

central crank case, is cast in one piece of steel of high tensile strength, and weighs only 7½ lb. Five of these cylinders are bolted together and bolted to a top aluminum flange (which also forms the gas manifold) weighing 3 lb., and to a bottom steel flange which also supports the valve cam and transmission gear. These flanges have long bronze bushes and form bearings around the vertical stationary crank shaft. In each cylinder is a cast iron piston weighing 2½ lb. All the pistons are connected to the single crank pin by bronze connecting rods which interlock each other around a bronze lined steel bush around the crank pin.

The cooling is one of the most important features. The cylinders move rapidly through the air like the arms of a centrifugal blower. Centrifugal force removes the air in contact with the cylinders and atmospheric pressure supplies fresh air. The circulation of air is equally rapid on all sides of all cylinders, and as the cylinders are of equal thickness on all sides the expansion is equal and the cylinders may be made light without distortion.



Two of the Farwell Air Ship Motors Made by the Adams Company, Dubuque, Iowa, Showing One Running to Illustrate the Absence of Vibration.

cam and are closed by centrifugal force instead of by springs, and that centrifugal force also introduces the gas into the cylinders under pressure. The motor is controlled like a Corliss steam engine, and the ignition system is the same as used on ordinary single cylinder motors.

The motor is similar to the revolving cylinder motor used in the Adams-Farwell motor car, and described in *The Iron Age* November 3, 1904, but of much lighter weight. With the spider shown in the photograph, which, in this case, secures the motor to four tubes, the motor and base and all weighed 104 lb. The light weight of this motor, which is air cooled, is brought about more by the simplicity of its construction and the high grade of the material used than by reduction of strength to the minimum. The motor is not what is usually termed a rotary engine. The cylinders revolve around a common center—the vertical stationary crank shaft and the pistons and connecting rods revolve around another common center—the single crank pin. At one point the pistons reach the head of the cylinder; at another point the pistons approach the base of the cylinder, but no moving part ever comes to a stop while the engine is running. It is a continuous circular motion and there is no shock, vibration or loss of power in overcoming the inertia of reciprocating parts as in other motors.

Each cylinder, complete with head and part of the

The result is entirely different from blowing air upon one side of a cylinder or row of cylinders.

The revolving element that acts as the balance wheel is over 80 per cent. of the entire weight of the motor. This heavy flywheel revolving rapidly around a vertical axis exerts an enormous force to keep the motor and that to which it is attached in a horizontal plane. The motor, like a top, has a tendency to resist being tipped over while spinning and to quickly right itself if forcibly thrown out of its proper running plane. This force can be utilized to maintain equilibrium in a flying machine. The heavy flywheel is also conducive to steady running and transmits a constant torque to the propeller. A gasoline motor, particularly one using high compression, transmits its power by a series of explosions or blows, and even though several cylinders may be used to divide up the impulses, the arms of the propeller or fan used to propel a flying machine are subjected to destructive strains unless a flywheel of sufficient weight is interposed between the motor and propeller. The heavy flywheel permits using high compression which is more economical and produces more power from the same size cylinder than the low compression usually used in automobile and aeronautic motors. This heavy flywheel, together with the variable compression system used for controlling the motor speed and power, permits of a very wide range of speeds.

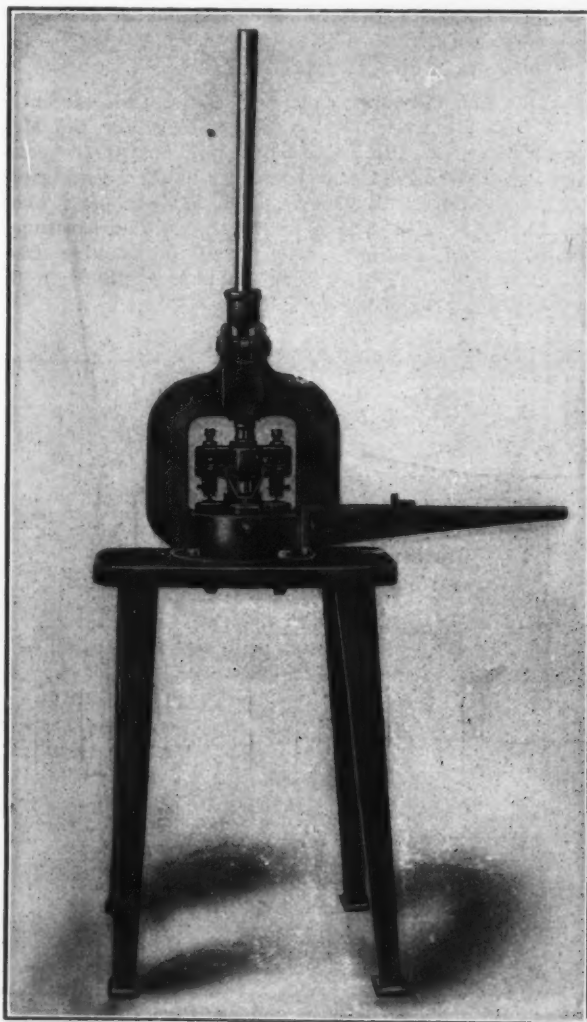
The variable compression system referred to has been used for several years on the automobile engines and consists in mechanically holding the inlet valve open for a part of the compression stroke and closing it after a part of the gas has been blown back and taken in by another cylinder which is at the time on the suction stroke. The compression is relieved and the motor is easily turned when it starts and runs slowly. The compression may be gradually increased until maximum speed and power is obtained and it may be as gradually reduced when stopping the motor. There is not that abruptness in starting or stopping which characterizes the ordinary gasoline motor and the propelling arms are thus relieved of much strain. After the motor is started the spark lever is set and requires no further attention. All speeds are obtained by the variable compression lever. The proper firing is cared for automatically.

The valves, being in the head of the cylinders, and closing outwardly, are closed by centrifugal force. The higher the speed of the motor the greater the force and the greater the necessity for a stiff force to close the valves quickly.

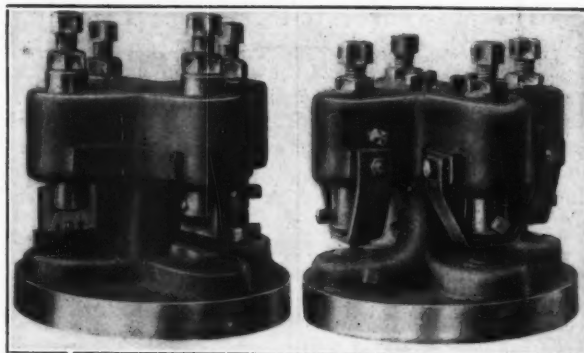
The two motors illustrated are now being used by a well known inventor who is making secret tests of a new type of aeroplane. If these tests result as favorably as might be expected in consideration of the advantages possessed by the motors a practical "heavier-than-air" flying machine may become a reality this summer.

A Walsh Turret Bench Press.

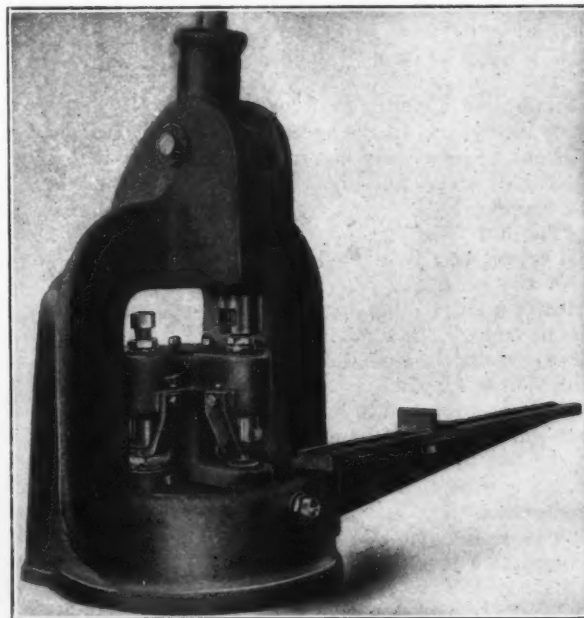
The machine illustrated has a turret carrying four sizes of punches or tools for doing various work, such as bending, shearing, wire cutting, riveting, embossing, &c., and is built by the H. C. H. Walsh Company, 2448 West Kinzie street, Chicago, Ill. The turret can be instantly adjusted from one operation to another by simply



A Turret Punching Press Built by the H. C. H. Walsh Company, Chicago, Ill.



Two of the Interchangeable Turrets Which May Be Used in the Walsh Turret Press.



The Walsh Turret Press as Made for Mounting on a Bench.

drawing the locking pin out in front and swinging the turret around until the plunger of the machine engages with a slide in the turret. Each separate slide in the turret is independently adjusted, so that in the grinding of punches or dies the wear can be taken up. There are no springs or delicate mechanism in this machine to prevent its standing the hardest usage.

Any number of turrets can be had with this machine, so that tools need not be changed for various operations. The turret is easily removed from the machine, as there are no screws to loosen; it is simply necessary to draw the front locking bolt and lift the turret out, replacing it with one to be used. There is an adjustable gauge on the side which can be set at a given distance, allowing any number of strips to be punched with any sized hole at this given distance with no change.

The capacity of the machine for punching is a 5-16-in. hole through $\frac{1}{4}$ -in. stock, and it will punch a hole in a strip $1\frac{1}{4}$ in. from the edge. The bench machine with one turret weighs 170 lb. and when fitted on an iron table and legs 310 lb. These machines will be built in various sizes to suit the requirements of the trade, and will be fitted to be worked either by hand or power.

Metillure.—At a recent meeting of the French Society of Civil Engineers Ad. Jouve reported on the opportunities for utilizing ferrosilicon alloys in the chemical industries. Ferrosilicon, or "metillure," as he has called it, has the property of showing extraordinary resistance to acids, and this has led to the suggestion that vessels for the chemical industry be made of it. It may be that platinum may be replaced in the manufacture of sulphuric acid. A new outlet would be found for ferrosilicon which is now exclusively used in steel manufacture.

The Milwaukee 16-in. Engine Lathe.

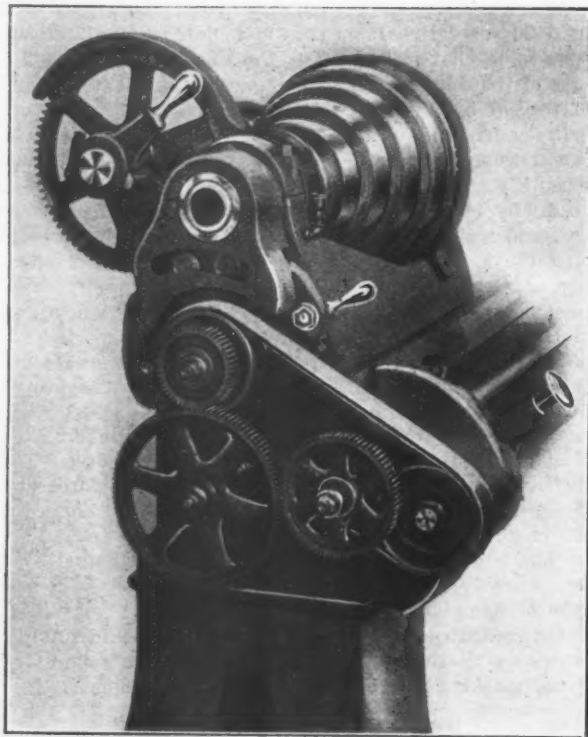
The new lathe shown in the accompanying engravings is an improved 16-in. plain engine lathe, built by the Milwaukee Machine Tool Company, Milwaukee, Wis. This machine is a tool designed principally for manufacturers desiring durable powerful machines capable of high cutting speed. The lathe is of an extra heavy design and differs from the ordinary plain lathe in having quick change attachment for all feeds. It has four changes of belt driven feeds and one feed taken from the lead screw when a coarser range of positive feeds is required. The feeds are driven by a wide belt mounted on two single faced pulleys, provided with a conveniently located belt tightener. For thread cutting the different pitches are obtained by change gears, which are furnished to cover a range of from 3 to 36 threads per inch; this also produces a range of positive feeds when engaged with the lead screw of from 10 to 108 per inch. The belt feeds have a range of from 30 to 80 per inch.

The apron is fitted with a clutch for the longitudinal traverse, and a sliding gear for the cross feed. The machine has reverse in the apron and a sliding lock for the half nut. Special care has been taken in the design and placing of all handles so as to be most convenient for the operator.

The bed is of heavy pattern, having unusual depth, and is strongly reinforced with heavy cross ties. The head and tailstock are massive in construction, and are fitted to a large V bearing in the rear and a flat bearing on the front. The headstock is designed with two large oil reservoirs located directly under the spindle, from which oil is supplied to the bearings by wicks. The tailstock is so formed as to leave clearance for the compound rest when used for angular feeds. The carriage is fitted to the bed by a large V bearing in the rear and front. It has a wide cross slide and a compound rest of large proportions.

The main spindle bearings are of phosphor bronze scraped to a bearing surface; the main bearing is 3 3-16 x 5 in. long. The spindle has a 1 9-16 in. hole running its length, is made of high carbon crucible steel cut from the solid and is ground. The centers are of tool steel with No. 4 Morse taper shanks. The cone pulley is unusually large, taking a 2 1/4-in. belt, and having a diameter of 11 in. on the largest step. All pinions and gears of importance are of steel cut from the solid. All studs throughout the machine are of steel hardened and ground.

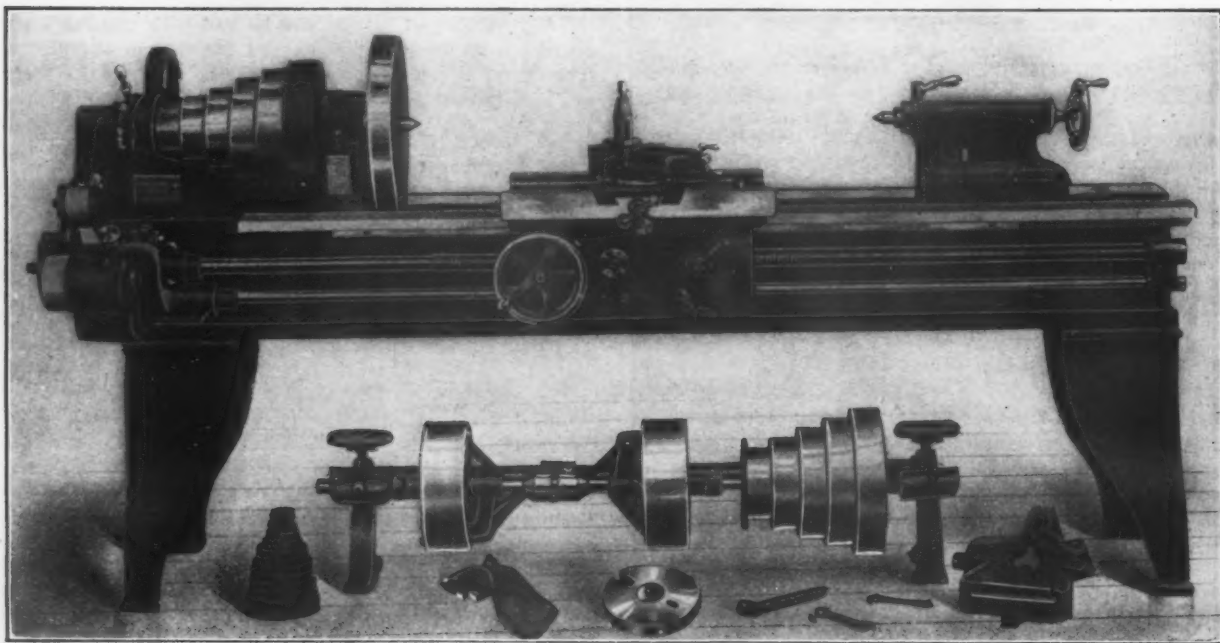
The Milwaukee lathe is at present built only in the



View of the Head End of the New Milwaukee Lathe.

16 in. size, which can be furnished with any length of bed from 6 to 16 ft. The net weight of the machine with an 8-ft. bed is approximately 2500 lb. complete, the machine is well proportioned throughout, the weight being evenly distributed. A double friction countershaft, compound rest, steady rest, follower rest, large and small face plates, together with all necessary change gears and wrenches, are furnished with each machine.

The Niles Car Mfg. Company, Niles, Ohio, recently built, in three weeks, two passenger cars for the Milwaukee Northern Railroad. The cars are of the combination smoking and passenger type, with a seating capacity of 52 persons. Each is 50 ft. 4 in. long, over all, and 40 ft. 2 in. long over the body. The passenger compartment is 28 ft. 1 in. long, and the smoking compartment 8 ft. 2 in. A special baggage vestibule, 8 ft. 3 in. is also provided.



The New 16-In. Engine Lathe Built by the Milwaukee Machine Tool Company, Milwaukee, Wis.

The Schellenbach-Hunt Protractor.

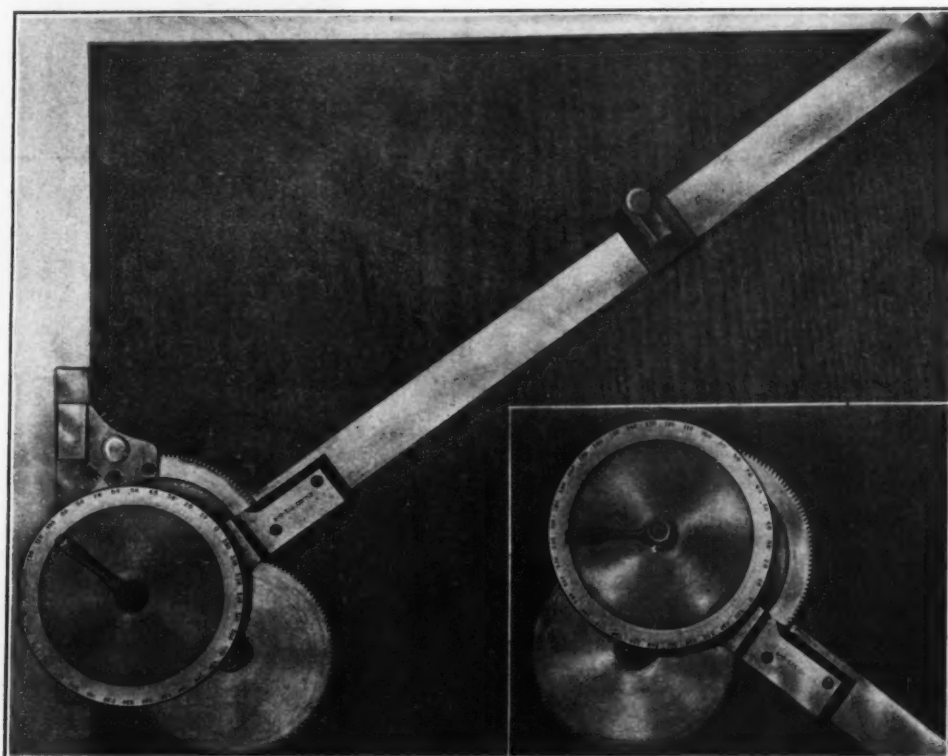
A new mechanical device for laying out angles and dividing circles is shown in the accompanying illustration. It is made by the Schellenbach-Hunt Tool Company, Cincinnati, Ohio, and can be used on a drafting board, as shown, or attached to a metal plate. It is useful in the tool-room, drafting department or pattern shop.

The center gear around which the arm swings has 144 teeth, and can be placed in any position and held stationary. The arm swings around this gear from its central stud and carries a pinion of 18 teeth meshing the stationary gear. Attached to this pinion is a revolving gear of 135 teeth, shown at the right, which meshes another pinion of 18 teeth carrying a pointer. One turn of the arm revolves the pointer or hand 60 times. The dial under the hand is graduated and reads to degrees and minutes. The engraving shows the device in two positions, one attached to the base piece and held on the edge of the drafting board as a bevel protractor. In this position the blade will move through a half circle. In the other position the base piece is removed and the large

The blade of the instrument is 12 in. long. The gears are made of German silver, and the spindles and bearings of steel, hardened, ground and lapped. The weight complete is 20 oz.

The Western Electric Company's Improvements.

Plans embracing a project that in extent and industrial importance outranks any similar work of the present year in that vicinity are announced by the Western Electric Company, Chicago. These include the erection of three buildings which will be added to the group comprising the company's new plant at Forty-eighth avenue and West Thirty-second street, known as the Hawthorne Works. Some idea of the extent of these additions is conveyed by the fact that between \$500,000 and \$600,000 will be expended in their construction. It is interesting to note that the plans outlined are not merely tentative, but that the new buildings will be started at once. That expansion of such magnitude should be planned for execution at this time, when the present capacity is only



Two Ways of Using the Mechanical Device for Laying Out Angles and Dividing Circles, Made by the Schellenbach-Hunt Tool Company, Cincinnati, Ohio.

gear held in the center of the board by thumb tacks passed through holes in the web of the gear. In this position the blade is free to move through the full circle. One edge of the blade is radial with the center of the stationary gear. A sliding block for a scriber or pencil is shown attached to the blade. The indicating hand can be set to any desired position in relation to the dial and clamped by knurled thumbscrews.

In using the device to divide a circle into 144 spaces, for example, the radial face of the blade is set in the desired position, and the hand moved to zero on the dial and clamped to the spindle. The blade is then moved until the hand coincides with 150 min. on the dial; the line is marked, and the blade next moved to indicate 300 min., etc. For dividing uneven numbers, as 47, for instance, a vernier hand reading to 5 min. can be furnished. As 47 will not divide in even minutes the fractional parts of the minutes will have to be estimated on the dial—a full circle, 21,600 min., divided by 47, equals 7 deg. 39 27-47 min. The hand is set at zero on the dial, and the blade moved to the right until the hand makes one revolution and 99½ min. on the dial; for the second division the hand is turned one revolution and to 199 min., and so on.

partially occupied, is particularly significant of confidence in the future development of business; it likewise emphasizes an appreciation of the opportunities offered under present conditions for the economical prosecution of such work.

Since the establishment of the Hawthorne plant, manufacturing formerly done in the Clinton street plant, located in the block bounded by Van Buren, Harrison, Clinton and Jefferson streets, has been gradually transferred to the new location, and when the additions are completed all manufacturing operations will be concentrated at that point. It is also the purpose of the company to transfer to the Hawthorne plant a large portion of the work now done in New York. One of the objects in view in extending plant facilities at Hawthorne is to provide adequate facilities for the manufacture of large dynamos and the building of steam turbines, which constitute a recent line of development in the company's undertakings and will be largely extended. The location at Hawthorne affords exceptional facilities for economical production. The plant is provided with adequate shipping facilities through a well arranged system of tracks, and the site is large enough to admit of a convenient plant layout.

The New Walcott & Wood Shaper.

Although in general following the usual design, the shaper recently produced by the Walcott & Wood Machine Tool Company, Jackson, Mich., has a number of important details intended to correct what are commonly weak points. Figs. 1 and 2 show front and side views of a 20-in. high speed crank shaper of the new design, and it will also be built in 16 and 24 in. and probably larger sizes in the future.

Among the parts that the builder considered could be improved were the ram bearings. After an experience of years in the designing, building and operating of shapers, the company concluded that the ordinary square form of ram bearings with caps screwed on to hold the ram to its work, even if suitable for general work, do not stay true long enough to be satisfactory where very accurate work is required; and besides they are likely to give under heavy cuts, producing a fan-tail cut. To over-

upward bearing of the ram substantially flat, this wedging tendency is avoided.

The design of the ram has been improved also by dispensing with the long slot usually necessary for the clamping stud. This is accomplished by placing the clamping device for binding the ram to the rocker arm entirely within the shell of the ram, so that a box form of ram is allowed with an unbroken outer surface and crossribs from side to side at short intervals its entire length, thus making what is claimed to be the strongest ram ever put on a crank shaper. The binding device is operated from a wrench hold *a* projecting through the top of the ram. The construction of this clamping arrangement is shown in Fig. 3. As may be seen, the inner surface of the ram has two lateral longitudinal ribs which engage the positioning nut *b*. The lower rear end of this positioning nut is cut away, admitting the clamping plate *c*, which is caused to bind upon the ribs and the positioning screw *d* at the same time. The clamping is done by means of eye-bolts and an eccentric lever, which is operated by a rack, *e*, through a pinion on the lower end of the stem of the wrench hold *a*.

The tool head is of a familiar design, but strongly constructed throughout. It is graduated, and swivels to any angle through an arc of 90 degrees, and has an ad-

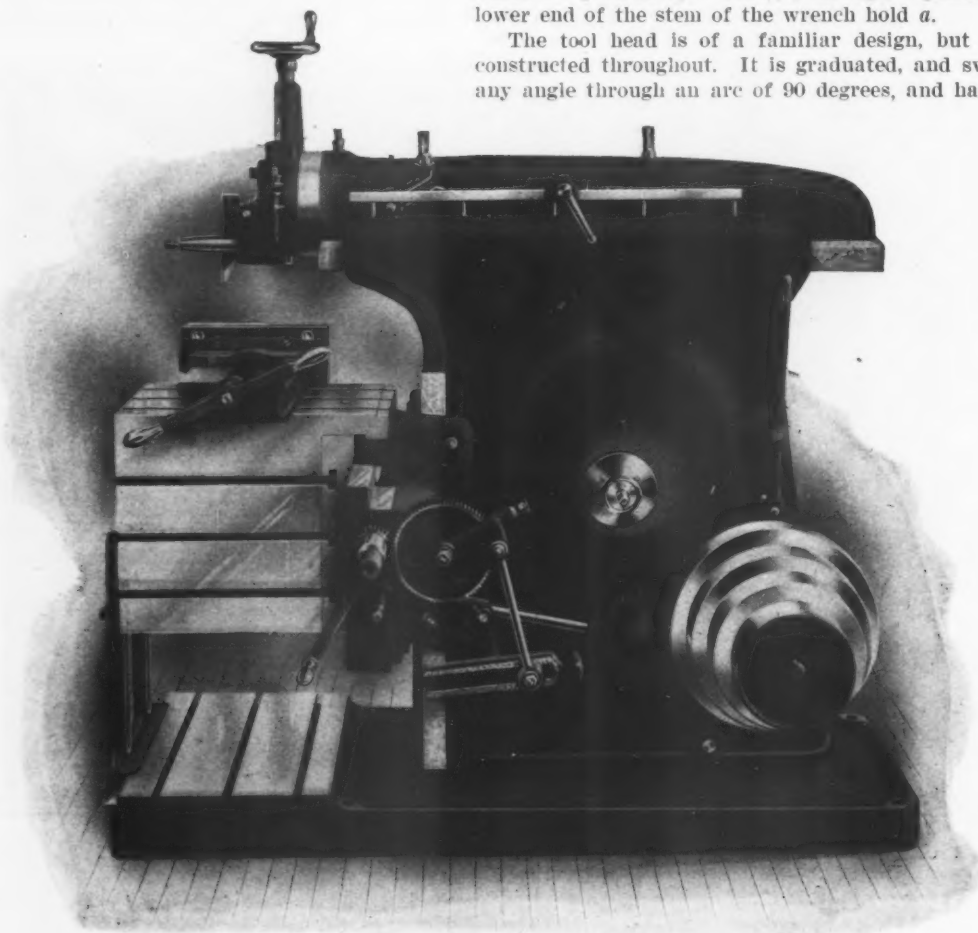


Fig. 1.—The New Shaper Built by the Walcott & Wood Machine Tool Company, Jackson, Mich.

come these defects the ram bearings of this new shaper are constructed as shown in the halftone Fig. 1 and in the drawings Fig. 3. The ram has flat bearings underneath, a very wide side bearing tapering slightly outward and upward and a wide top bearing tapering slightly upward and inward. The column is cast with recessed ways to receive the ram bearings, and taper wedge gibs are provided to take up wear. To maintain the sidewise alignment of the ram the side bearing is more than 60 per cent. greater than customary. The lower is proportioned to the side bearing surface so that the ram will wear downward in its bearing, and the side bearings, being tapered outward and upward, automatically compensate the lateral wear. The bearing surfaces on the ram are virtually surrounded on three sides by the solid metal of the column, which is apparently the strongest possible construction. When screwed on caps are used, fitting the ram bearing surfaces at an angle of 45 degrees, there is a tendency for the ram to wedge under the upward pressure of a heavy cut, producing uneven work and chatter marks. By making the

adjustable graduated collar reading to 0.001 in. on the down feed screw. The tool head slide has a graduated scale and pointer to indicate the depth of cut; the pointer is adjustable so that it can be set to an even division of the scale. The clapper box is strengthened by a tie rib *f* connecting both sides at the bottom, which greatly increases its rigidity. The tool head has a strap tool post and power down feed, as shown in Fig. 3. The down feed mechanism consists of the rail *g* mounted on top of the column and a dog adjustable along the rail and having a projecting pin which engages with the slotted lever *h*. The motion of the lever is positive in both directions, requiring no spring to return it. It is connected with the down feed screw, as shown, by gearing and a ratchet which can be thrown in and out at will.

The driving gears are unusually strong and the back gear ratio very large. The main drive is from a four-step cone driving pulley which runs on the outside of a stem cast on the column, through a double sliding gear *i* on the cone shaft and back gears on an intermediate shaft, which connect with the bull gear *j*. On the other

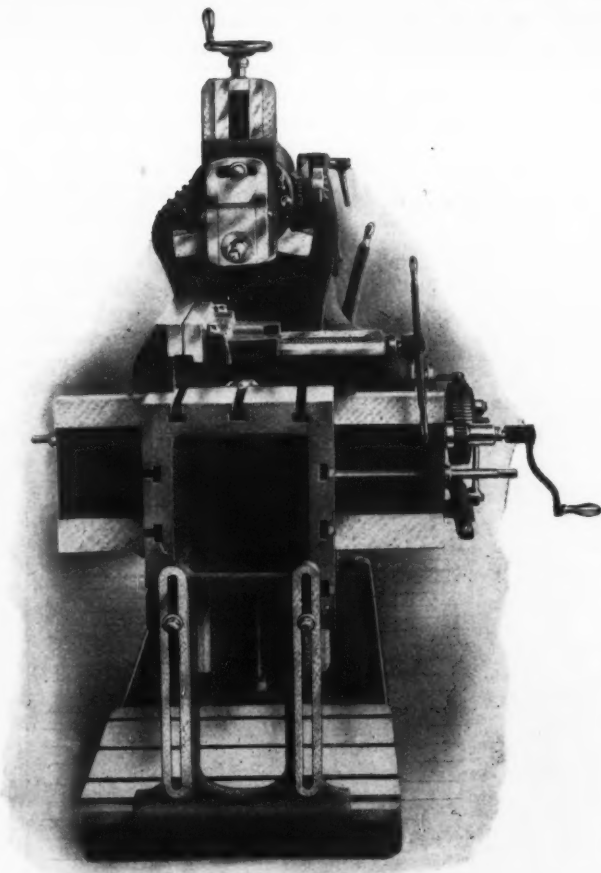


Fig. 2.—Front View of the New Walcott & Wood Shaper.

end of the bull gear shaft is an elliptical gear, *k*, which meshes a second elliptical gear attached to the main driving crank *l*. The elliptical gears give a suitable quick return of the ram and a greater power during the cut without necessitating excessive speed of the shafts and gears. The elliptical gear arrangement is considered preferable in construction to the Whitworth quick return and gives a smooth, positive drive, besides eliminating the wear that attends the Whitworth quick return. The drive gives eight cutting speeds for each length of stroke

and is smooth and powerful. The ratio of gearing with back gears is 32 to 1.

The driving crank *l* is made very strong and rigid, the bearing for the crank being large and long, as shown in Fig. 3, and integral with the column. The length of stroke is adjusted by means of a shaft passing through the center of the crank, which, through gears, turns the screw *m* and alters the position of the adjusting nut and crank pin *n* so as to increase or decrease the throw of the crank. The nut *n* slides in ways on the face of the crank *l* and is provided with a long bearing and a taper gib to take up wear.

The rocker arm is a very important part of a shaper and its design has been given especial attention. It is unusually long and, when the ram is at either extreme of its stroke, is less than 15 degrees from perpendicular. Unnecessary friction and wear on the ram bearings due to excessive angle of the rocker arm are thereby avoided. The recess for the crank block is of box form, as shown in Fig. 3, and contains a taper gib to take up wear. The fork in the top of the rocker arm allows shafting to be passed through under the ram for cutting keyways. The pivot pin at the top of the rocker arm connecting it to the positioning nut has a very large bronze-bushed bearing and is tapered to take up wear.

The cross rail is of box form and is designed to withstand the strain due to taking heavy cuts. Its bearings *o* on the front of the column are slightly bevelled on the outside to adjust for wear without having to rely upon the pressure of a few gib screws to maintain the alignment. The cross rail is long and deep and has ample bearing surfaces for the apron. The apron is provided with a taper gib to take up wear. The table is of box form and can be detached readily to allow work to be clamped to the face of the apron. The table is locked to the apron in a simple and effective way, as shown in the halftone Fig. 2, and also has a convenient detachable outer support.

The table cross feed mechanism is quite out of the ordinary, doing away with necessity for adjusting the feed to correspond with the height of the cross rail. As shown in Fig. 3, it consists of the miter gears *p* and *q* connected by a splined shaft to transmit motion from the bull gear shaft to the small crank *r*, which, through a connecting rod, actuates the rocker *s*. This rocker has an adjusting screw and trunnion nut which is connected by a rod to the ratchet lever *t* mounted on a stud in the

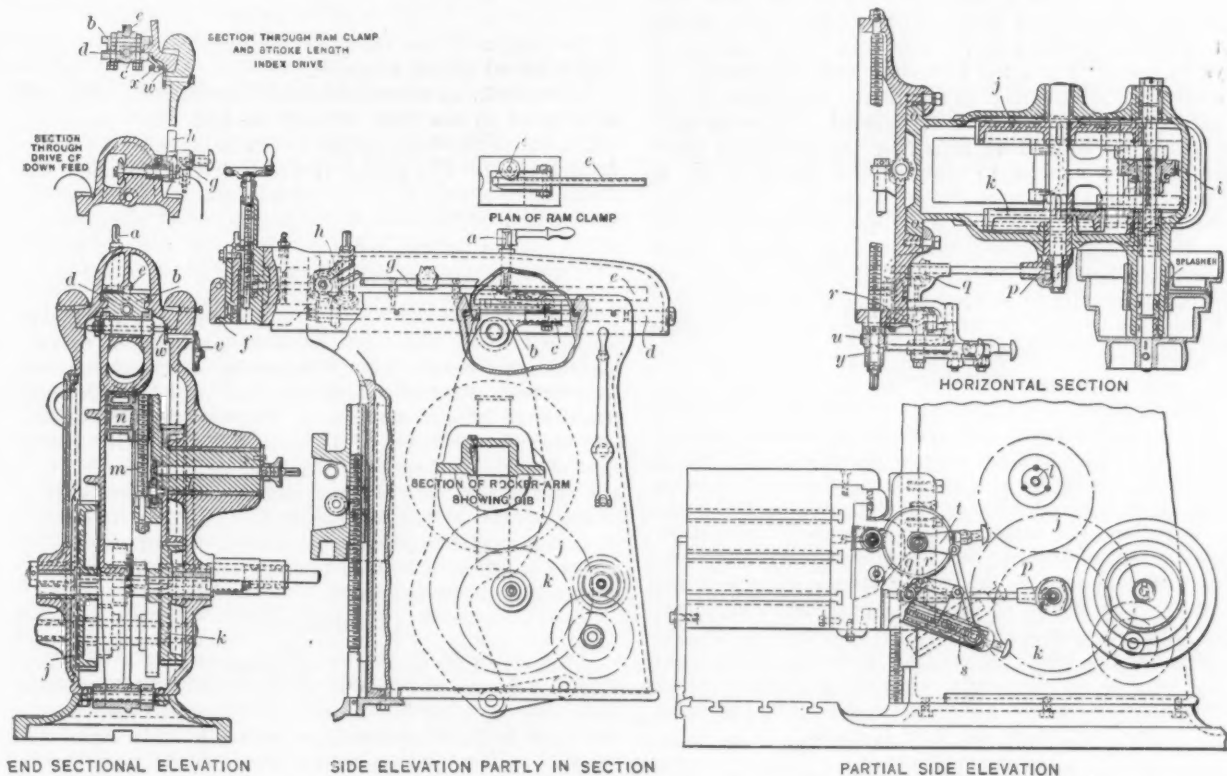


Fig. 3.—Constructional Details of the New Walcott & Wood Shaper.

cross rail. The ratchet operates a gear which meshes a pinion *u* loosely mounted upon the cross rail, but connected to the cross feed screw through a spring clutch *v* capable of sliding on the screw. This spring clutch introduces a yielding link in the transmission so that if the table accidentally runs to the extreme of its travel the pressure on the clutch teeth forces the clutch out of mesh and prevents breaking any parts.

For convenience in adjusting the length of stroke an index is provided to show it. This index, *v* Fig. 3, is a dial on the side of the machine just above the stroke adjusting shaft with a pointer oscillating over its face. This pointer is driven through gears by the rack *w* which is connected by the screw *x* to a lug on the ram positioning nut.

All bearings are bushed with bronze bushings and all rapid running bearings have ring oilers, the construction of which is shown in Fig. 3. The driving cone has two half bushings with oil chambers between them; a splasher attached to the pulley throws the oil up over the stem and keeps the bearings thoroughly lubricated. Convenient oiling facilities are provided for all running or sliding bearings. All shafting is of steel ground to size, and all gears are cut from the solid, are coarse pitch and wide face, and all pinions are of steel.

The vice, as shown on the halftones Figs. 1 and 2, is designed to rest flat upon the top of the table, this forming the most rigid possible construction. It has a swivel base and is graduated.

The maximum stroke of the machine is 20 in.; the length of ram bearing in the column 36 in.; the keyseating capacity $3\frac{1}{2}$ in.; the horizontal travel of the table 27 in., and the feed to the head 7 in. A 3-in. driving belt is used, which runs from a countershaft having $4\frac{1}{2} \times 14$ in. tight and loose pulleys. The countershaft is intended to run at 350 rev. per min. The net weight of machine and countershaft is 4100 lb.

Customs Decisions.

Steel Channels for Automobile Frames.

It has been decided by the Board of United States General Appraisers that side frames and cross pieces used in the construction of chassis for automobiles are dutiable at the rate of 5-10 cent per pound under paragraph 125, providing for channels or car truck channels. The articles were imported by the Napier Motor Company of America, and were assessed for duty by the collector of customs at 4 7-10 cents per pound under the paragraph in the tariff for "steel in all forms and shapes not specially provided for." The decision of the board says in part: "From the testimony and the exhibits in the case, we are inclined to regard the contention of the importers in this case as well founded. Not only does the testimony offered in behalf of the importers show that the steel articles in question are channels, but it further appears that even the witnesses for the Government admit that in shape the articles are channels, and that they are not complete manufactured articles. Thus the articles appear to be ordinary steel channels for car trucks, and require to be further manipulated before they are ready to be used as finished frames for automobiles. The protest is sustained."

Steel Wool.

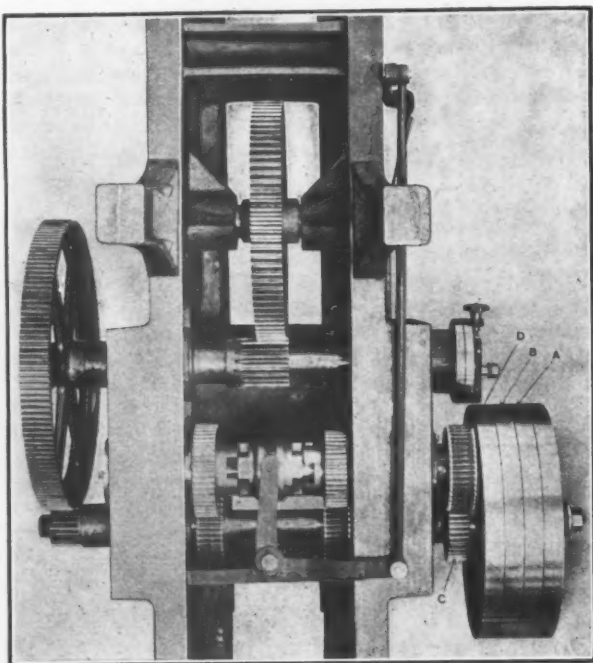
The Treasury Department announces that inasmuch as the Supreme Court has refused to grant a writ of certiorari in the litigation over the tariff classification of steel wool, the decision of the Circuit Court of Appeals favorable to the contention of the Buehne Steel Company, the importer, will stand. The Government, backed by domestic manufacturers, has brought several test cases since 1902 to determine the rate of duty applicable to the product. The Board of General Appraisers and courts have almost unanimously upheld the contention of the importers for the lower duty. The Treasury Department asked for a 45 per cent. duty, while the importers alleged that the rate should be according to the gauge and value of the wire from which the wool is made.

With the July copy, the Du Bois Iron Works, Du Bois, Pa., has begun the distribution of a series of 12 monthly

calendars, each bearing a reproduction in colors of one of May A. Post's paintings of "Child Life in Holland." A leaflet accompanies the July calendar, containing a brief description by the artist of each picture. The reverse sides of the cards will contain short talks on the company and its products, engines and pumping machinery.

A New Variable Speed Planer Mechanism.

The variable speed mechanism shown in the illustration is designed to give two cutting speeds and one constant return speed to the planer table of planers smaller than 36 x 36 in. On that size and larger planers four cutting speeds may be had, if desired, by introducing a second clutch. The builder, the Woodward & Powell Planer Company, Worcester, Mass., has made the positive clutch and the gears of massive construction; there



The Variable Speed Planer Drive Used by the Woodward & Powell Planer Company, Worcester, Mass., as Seen from Beneath.

is no danger of the clutch slipping out of engagement unless forced out by its lever.

The clutch, mounted on an auxiliary shaft, is operated by a lever on the front side of the bed. The pulley A which drives the table on the return is keyed to the main driving shaft. The pulley B which drives the table for the cut has a long hub upon which the loose pulley revolves, and on the end of the hub is keyed the gear C, which also revolves loose on the main driving shaft. This gear meshes the rawhide gear D, which is keyed to the auxiliary shaft, as is also the sliding clutch. The two self-oiling, cast iron clutch gears on the auxiliary shaft are loose, and mesh rawhide gears keyed to the main driving shaft. Thus the position of the clutch determines the speed of the cut, or when out of engagement permits the table to stand idle. When cutting, the auxiliary shaft is the driver of the main shaft, the effect being that of back gearing, with resultant gain in power. On the return the main driving shaft is the driver. The ordinary ratio of the two speeds is 3 to 2, but this may be varied to suit requirements. As already suggested, the greater width of a 36-in. planer permits the use of two clutches, giving four speeds.

Data gathered at Detroit, Mich., show that 1780 lake vessels are out of commission at the present time and that 14,000 employees are idle. President Livingstone of the Lake Carriers' Association says that only about 40 per cent. of the total tonnage of that association is under way at present, though there has been some slight improvement in the past few weeks.

LA BELLE IRON WORKS IMPROVEMENTS.

The New 72-in. Plate and Jobbing and Sheet Mills of the La Belle Iron Works, Steubenville, Ohio.

Herewith are presented two ground plans, Figs. 1 and 2, one showing the general layout of the extensive plant of the La Belle Iron Works at Steubenville, Ohio, and the other the new 72-in. plate and jobbing and sheet mills, these being recent additions. In *The Iron Age* of October 8, 1903, appeared an illustrated article describing the plant as it existed at that time. In *The Iron Age* of December 7, 1905, an illustrated description was given of the new 84-in. plate mill. No other additions were made to the plant until the fall of 1907, at which time work was commenced on the erection of the new 72-in. plate and jobbing and sheet mills. The entire plant now occupies an area of 126 acres, and has 16 miles of its own railroad tracks that connect with the Pittsburgh, Cincinnati, Chicago & St. Louis Railroad, the Cleveland & Pittsburgh Railroad and the Wheeling & Lake Erie Railroad, thus making its facilities for receiving and shipping materials the very best.

The Blast Furnace Plant.

The company owns two blast furnaces, each 90 ft. high, 20 ft. diameter of bosh, with 13 ft. hearth, and equipped with Brown top with revolving distributor. No. 1 furnace was originally built in 1865, rebuilt in 1889 and torn down and rebuilt in 1901-1903, the first pig iron being made at the rebuilt stack April 28, 1903. No. 2 furnace was built in 1903-1904 and was first blown in October 31, 1904. Each furnace is served by four McClure three-pass stoves, 21 x 80 ft., built by G. W. McClure, Son & Co., Pittsburgh. The ore is handled by a 5-ton Brown hoist traveling ore bridge that spans the stock pile and the parabolic bins, from which latter it is conveyed in overhead larries to the furnaces. The air is supplied by three horizontal cross compound blowing engines, 44 and 84 x 84 x 66 in., built by the Mesta Machine Company, Pittsburgh, and conveyed in two 48-in. riveted steel pipes across the Cleveland & Pittsburgh Railroad to the furnaces. The iron is taken in 25-ton hot metal cars, either directly to the open hearth plant or to the two pig casting machines built by Heyl & Patterson, Pittsburgh. The capacity of the two furnaces is 800 tons a day.

The Open Hearth Plant.

This consists of 10 50-ton stationary furnaces. The stock is loaded on buggies in the stockhouse and elevated by mechanical up-haul to the charging floor, where it is charged in the furnaces by two Wellman-Seaver low type charging machines. The empty buggies are returned by a gravity track system to the stockhouse for reloading. The gas producer house, east of and parallel with the open hearth building, contains 40 Laughlin gas producers, the coal being brought there in cars on an overhead track directly from the mine. The capacity of the open hearth plant is 35,000 tons of ingots per month.

The ingots, after being stripped by two Wellman-Seaver electric strippers, are placed in the soaking pits and then transferred by an electric car to the 45-in. blooming and slabbing mill, driven by a pair of 46 x 60 in. geared reversing engines, both mill and engines having been built by the Mesta Machine Company, Pittsburgh. They are rolled into slabs and billets, which are cut and loaded in cars or run directly to the 22-in. continuous mill with a 24-in. three-high finishing mill, where they are further reduced to plates, skelp or sheet bars. The capacity of the blooming mill is 35,000 tons a month and that of the skelp mill is 15,000 tons a month.

West of these mills and parallel with them are two stands of 22-in. three-high mills for rolling smaller skelp and bars, the capacity of these mills being 5000 tons a month. The skelp is carried in standard cars to the tube mills at the south end of the plant and there made into pipe in sizes ranging from $\frac{1}{4}$ to 12 in. in diameter. The present pipe equipment consists of two lap weld and two butt weld mills, a socket shop and galvanizing department. The mills with equipment were built by the United Engineering & Foundry Company, Pittsburgh, and the furnaces and gas producers by Alex Laughlin & Co., Pitts-

burgh. The output from the tube plant is about 7000 tons a month.

Power Plant.

There are three separate boiler houses, all equipped with Stirling boilers, their aggregate capacity being 15,000 hp., of which 7000 hp. is fired with gas from the blast furnaces and the remaining 8000 with slack coal, the Green chain grate stoker being used for this purpose. The ashes are conveyed by electric ash cars to elevators and loaded into railroad cars. The electric power plant is built directly south of the blast furnaces, and has a generating capacity of 2000 kw. direct current and 1000 kw. alternating current.

The capacity of the two pump houses at the edge of the Ohio River is about 35,000,000 gal. a day, a part of which is filtered and used for hydraulic purposes.

Coal and Iron Properties.

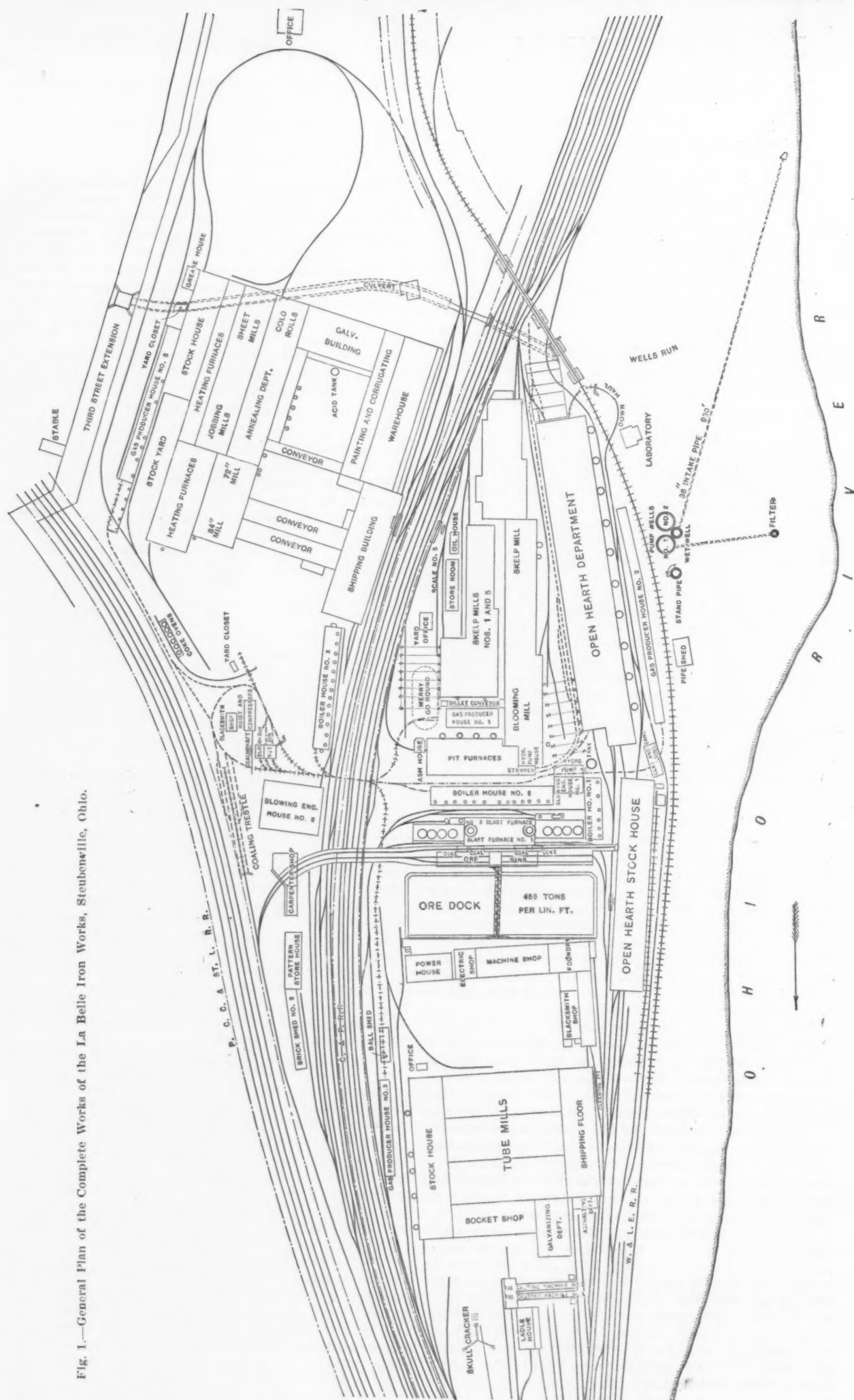
The La Belle Iron Works is absolutely self-contained, manufacturing all its products from the ore to the finished material. The company owns and controls the Pitt Iron Mining Company, Steubenville, which operates the Wacootah, La Belle and Miller ore mines in Minnesota, and also owns 6000 acres of coal lands in Brooke, Jefferson, Randolph and Ohio counties, W. Va., and in Fayette County, Pa. The coal lands in Randolph County are undeveloped, but coal is mined at all of the other mines named. The company controls the La Belle Coke Company, which operates 200 beehive coke ovens in Fayette County, Pa., with an annual capacity of 150,000 tons. The company also owns 99 acres of undeveloped limestone property in Berkeley County, W. Va. The coal from the properties in Ohio and in West Virginia, across the Ohio River, is hauled by electric locomotives to the main shaft, shown on the general plan, Fig. 1, where it is hoisted, crushed and stored in bins, whence it is distributed to the different parts of the plant by an overhead track system.

The New 72-In. Plate and Jobbing and Sheet Mills.

The plate and sheet mills shown in the larger scale on Fig. 2 are the most recent additions to the plant and are located west on the Cleveland & Pittsburgh Railroad. The raw steel for these mills is brought in cars and unloaded in the slab yard or at the bar shear in building O, where it is cut in lengths, loaded on buggies and hauled by electric storage battery locomotives to the different furnaces. The buildings covering these mills were built by the Ritter-Conley Mfg. Company, Pittsburgh, their sizes being as follows: Building A, 100 x 250 ft.; B, 100 x 200 ft.; D and Dx, each, 50 x 250 ft.; E, 100 x 325 ft.; F, 30 x 400 ft.; G, 40 x 400 ft.; H, 80 x 400 ft.; I, 80 x 400 ft.; J, 30 x 200 ft.; K, 25 x 190 ft.; L, 50 x 350 ft.; M, 82 x 350 ft.; N, 25 x 60 ft.; O, 75 x 300 ft., and P, 100 x 190 ft., with a 15-ft. lean-to.

Referring to the plan, Fig. 2, it will be noted that there are two plate mills located in building B. The first of these is a 30 x 84 in. three-high plate mill, with 30-ft. lifting tables, which was fully illustrated and described in *The Iron Age* of December 7, 1905, but a brief repetition of its main features would be of interest at this time. The middle roll and tables are raised by hydraulic power and the table rollers are driven by electric motors, two being mounted on each table. The mills and tables were built by the United Engineering & Foundry Company. The engine driving the mill is a 44 x 60 in. Corliss engine, built by Mackintosh, Hemphill & Co., Pittsburgh.

The slabs for this mill are heated in two Laughlin continuous heating furnaces and delivered to the mill by means of a roller table built by the United Engineering & Foundry Company, which also built the runout tables and plate straightener. The marker's table between the runout table and shear consists of a four-strand roller chain conveyor 15 ft. long, built by Heyl & Patterson, Pittsburgh. The plates, after being marked, are run through a 110-in. cross cut shear built by the United En-



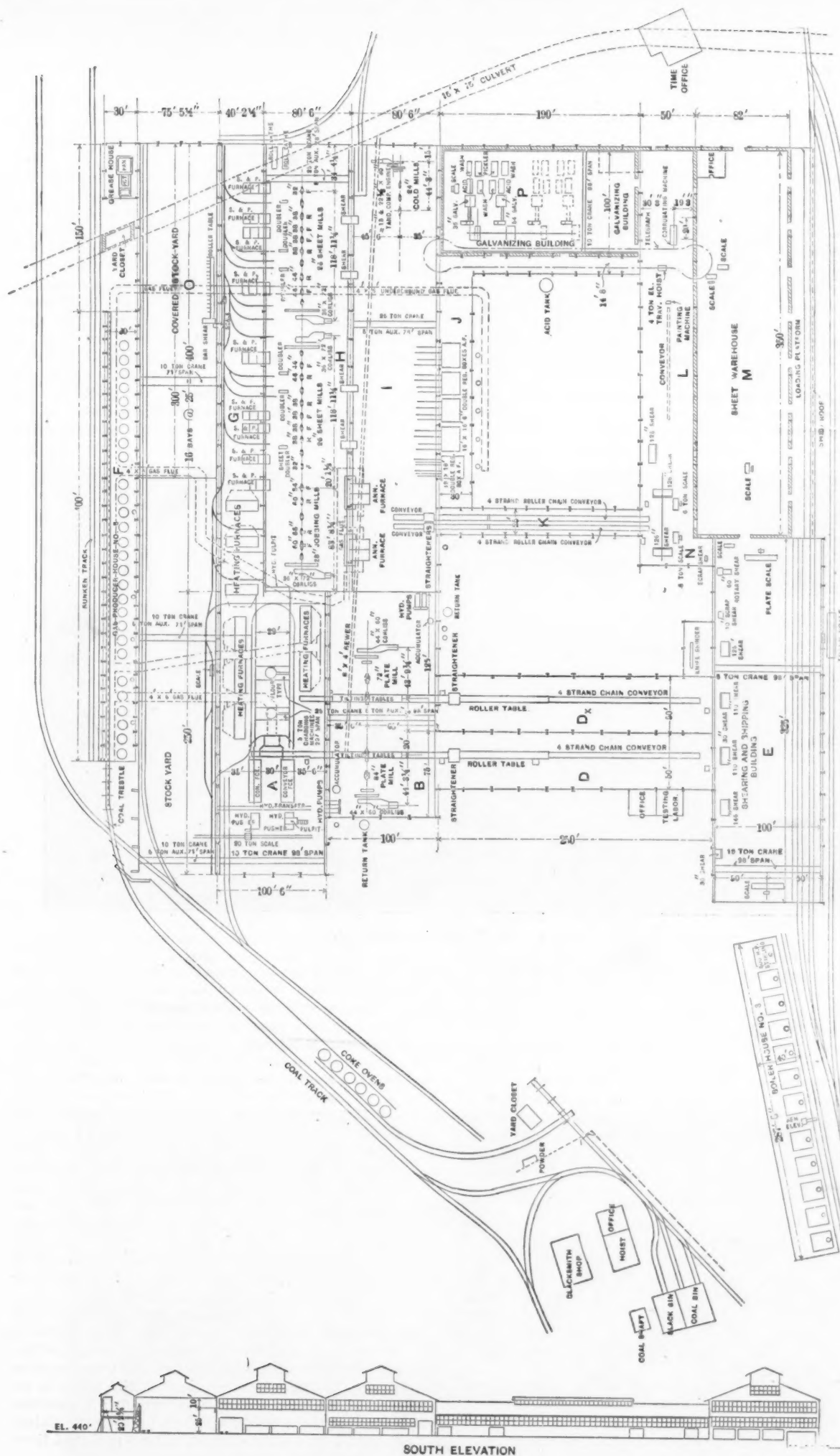


Fig. 2.—Plan of the New 72-In. Plate and Jobbing and Sheet Mills of the La Belle Iron Works.—An Enlarged Plan of the Upper Right Hand Corner of Fig. 1.

engineering & Foundry Company, where they are cut to lengths and then run on casters to the 146-in. trimming shear, built by the Hilles & Jones Company, Wilmington, Del., whence they are taken to the plate scales, weighed and loaded in cars.

The New 72-In. Plate Mill.

This mill has just been completed. It is practically a duplicate of the 84-in. mill. The rolls are 12 in. shorter, or 72 in. long, and the lifting tables were made correspondingly narrower and with some improvements over the tables in the 84-in. mill. The mills and tables, Fig. 3, were built by the United Engineering & Foundry Company, and the 44 x 60 in. Corliss engine driving the mill was built by Mackintosh, Hemphill & Co. The tables, conveyor and cross cut shear are exact duplicates of those in the 84-in. mill. The trimming shear for this mill is a 125-in. Hilles & Jones shear. The slabs are heated in five Siemens regenerative heating furnaces built by Alex Laughlin & Co., the charging and drawing being done by a two 3-ton floor type charging and drawing machine, Fig. 4, built by the Alliance Machine Company, Alliance, Ohio. The machines can also deliver slabs to the 84-in. plate mill. The capacity of these two mills is 6000 and 5000 tons of plates a month, respectively.

Both finishing and roughing rolls are carried in cast steel close top housings, which weigh approximately 26,000 lb. each. They are provided with 8-in. diameter steel screws carried in bronze nuts. The finishing rolls are hand adjusted by means of a large spanner wheel.

The roughing stands, which require a far wider range of adjustment, are provided with motor driven screw downs, one motor to each stand. This motor, a Westinghouse series wound railroad type, is geared to a shaft which carries right and left bronze worms, engaging with corresponding cast iron worm wheels on the adjacent screws. By mounting the motor on a bracket near the top of the roll housing a very effective and compact arrangement is obtained. The top roughing rolls have a lift of 6 in. and are therefore balanced by weights and levers. Bronze top and bottom bearings 12 in. wide and bronze side bearings 6 in. wide are fitted to all roll necks. These rolls have necks 21 in. in diameter and 17 in. long, while the wabblers, which are four pawed, are 18 in. in diameter and 9 in. long. The 30-in. double helical cast steel pinions, through which a drive is connected to the upper rolls of the roughing stands, are carried in cast iron Babbitt lined bearings, which are mounted in air furnace iron open top housings. The caps for these hous-

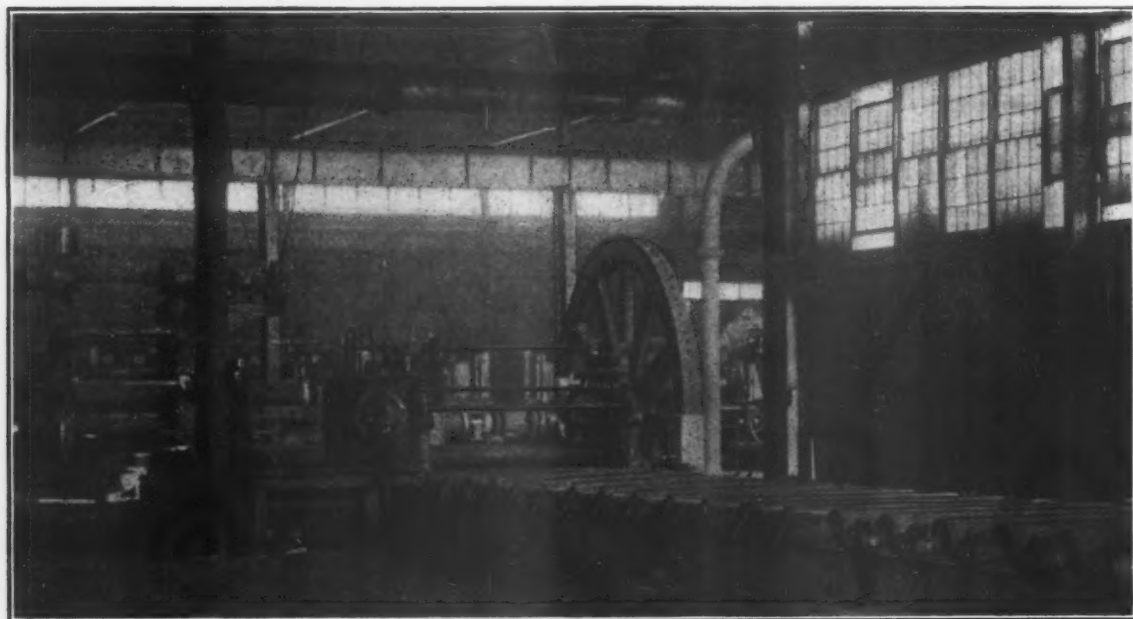


Fig. 3.—The New 72-In. Plate Mill.

The electric traveling cranes for these mills comprise one 10-ton, with 5-ton auxiliary 71-ft. span Morgan crane, and one same capacity Alliance crane over the slab yard; one 10-ton 98-ft. span Alliance crane in the furnace building A; one 25-ton with 5-ton auxiliary 98-ft. span Alliance crane in the mill building B, and one 10-ton 98-ft. span Morgan crane and one 5-ton 98-ft. span Alliance crane, both in the shipping building E. The hydraulic power is furnished by four 16 and 25 x 7 $\frac{1}{4}$ x 16 in. compound duplex pumps, built by Epping, Carpenter & Co., Pittsburgh, the pressure being regulated by two 16-in. accumulators built by the United Engineering & Foundry Company.

The Jobbing Mills.

Referring to Fig. 2, it will be noted that in the south end of the building H are located the 28-in. jobbing mills, consisting of one 60-in. finishing mill with a 60-in. roughing mill, and one 54-in. finishing mill with a 60-in. roughing mill, driven by a Mesta heavy duty simple Corliss engine, 36 in. in diameter and 72-in. stroke, with a 30-ft. 100-ton flywheel. The two roughing mills furnished by the Mesta Machine Company are mounted on shoe plates about 77 ft. in length.

By locating the pinion housing in the middle of the train the two roughing stands, which are mounted on either side, are provided with a positive drive for both upper and lower rolls, and the finishing stands are then placed at either end of the train to complete the arrange-

ments are secured by 4-in. diameter steel bolts. On the sides of the pinion housings is furnished a supporting bracket for the adjacent vibrating spindle carriers.

Since this mill runs in one direction only, double helical pinions are better adapted to the services than spur. These pinions are shrouded to pitch line and are molded to a patented Mesta gear molding machine, which insures perfect spacing of teeth. This method reduces the back lash to a minimum, and overcomes troubles due to draft and inequalities in full pattern molded pinions. Each stand of rolls is fitted with rest bars on both sides for plates and guides, making the whole train complete.

The slabs are heated in three Siemens regenerative heating furnaces built by Alex Laughlin & Co. and conveyed to the roughing mills by means of telegraphs. From the finishing mills the plates are passed through the blue annealing furnaces built by William Swindell & Brothers, Pittsburgh, and then to two four-strand roller chain conveyors built by Heyl & Patterson, which convey the plates to the straightening rolls built by the Hilles & Jones Company, and thence to the two 126-in. Hilles & Jones shears located at the south end of building L, where the plates are sheared to size, weighed and transferred on hand trucks to the warehouse marked M. There is an auxiliary shear near the other shears for reshearing, also a scrap shear in building N, both built by the United Engineering & Foundry Company. The capacity of these mills is 3000 tons a month.

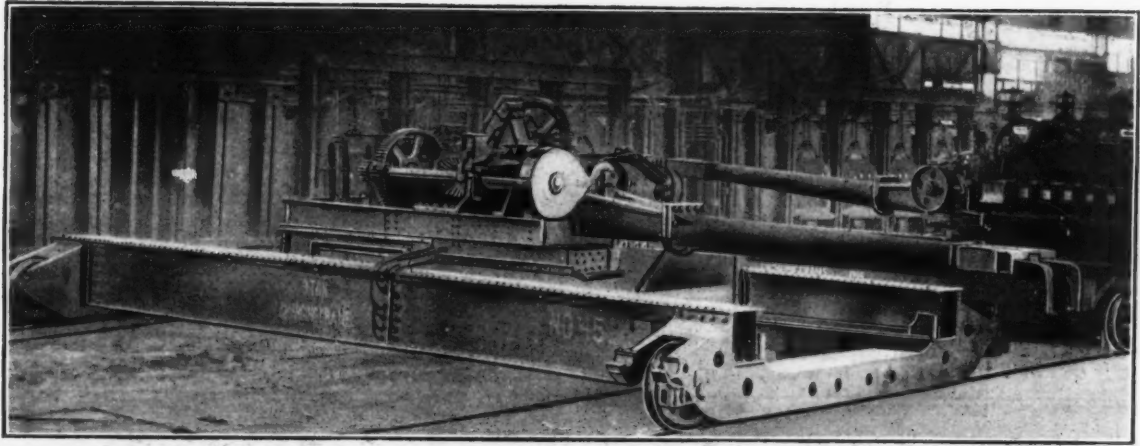


Fig. 4.—Slab Charging and Drawing Machine for the 72-In. Plate Mill.

The New Sheet Mills.

There are two 26-in. sheet mill trains, Fig. 5, located in line with the 28-in. jobbing mills, each train consisting of one 44-in. two 38-in. and one 32-in. finishing mills, and one 44-in. and two 38-in. roughing mills, with two sets of pinions. Each train is driven individually by a 36 x 72 in. direct connected Corliss engine, with a 30-ft. 100-ton flywheel built by Mackintosh, Hemphill & Co.

Of the mills, which are exact duplicates, the Mesta Machine Company built one train and the Wheeling Mold & Foundry Company the other. All of the mill housings are of cast steel and weigh practically 26,000 lb. each. The pinion housings are of air furnace iron and weigh 15,000 lb. each. All pinions are of cast steel, 26½ in. pitch diameter, 26-in. face and 6-in. pitch, with V teeth. All coupling boxes and spindles are of cast steel. The finishing rolls are chilled and all roughing rolls are sand rolls. All rolls have necks 20 in. in diameter and 16 in. long, with wabblers 18 in. in diameter and 9 in. long.

Steel housing nuts and 8-in. screws of 1-in. pitch are used on the roughing mills, with bevel gear and hand wheel screw down. The upper roughing rolls are balanced and have a lift of 6 in. The screws on finishing rolls are of the same diameter as those on roughing mills, but of ¾-in. pitch. The usual spanner wheels and wrenches are used on these mills. The bed plate under these mills weighs 500 lb. to the foot each side and the sections are securely bolted together, making total length of 112 ft. 4½ in.

In addition to the hot mills the Wheeling Mold & Foundry Company also furnished the 24-in. cold mill, consisting of three stands with cast iron housings, each weighing 15,200 lb. The bed plate for this mill weighs 350 lb. to the foot on each side and has a total length of 38 ft. 8 in. The leading spindle on this mill is of cast steel, all other spindles and boxes being of cast iron. The bars and sheets are heated in eight coal fired combination sheet and pair furnaces built by William Swindell & Brothers, who also built the five double regenerative box an-

nealing furnaces located in building J. The gas for the annealing furnaces is supplied by six Swindell producers located in the gas producer house, in line with the 22 Laughlin producers that furnish gas to the plate and jobbing mills. There are six steam driven sheet doublers built by Bowdle Brothers, also four 126-in. squaring shears, two built by the United Engineering & Foundry Company and two built by the Erie Foundry Company.

The sheets, after being squared, are taken to the cold mills, Fig. 6, located in the north end of building I, there being one 54-in. and two 46-in. mills built by the Wheeling Mold & Foundry Company. The cold mills are driven by a 13 in. and 22½ x 30 in. tandem compound Buckeye engine through a pair of gears. The sheets after passing through the mill are piled directly on the annealing bottoms, which are picked up by the crane and carried to the annealing furnaces. The cranes over the mills and the annealing floor are both 25 tons capacity, with 5-ton auxiliary hoist, the span being 78 ft., and were built by the Morgan Engineering Company, and the crane in the bar shed O is of 10 tons capacity and 71 ft. span, built by the Alliance Machine Company. The eight sheet mills have a capacity of 4000 tons a month.

The galvanizing department, located in building P, is equipped with one 36-in. and one 54-in. galvanizing machine, two levelers and two pickling plants, built by the Erie Foundry Company. A 10-ton Morgan crane is installed in this building to serve the machines and handle the pickling crates. The output of this plant is about 1200 tons of galvanized sheets a month.

In building L are located the corrugating machines built by the Poorman Company, also a painting machine built by the J. H. Day Company, Cincinnati, Ohio. The sheets are brought to these machines by a 4-ton Sprague electric monorail crane traveling on a suspended track, as indicated in dotted lines on the plan.

The sheet warehouse, Fig. 7, is an iron and brick building, 82 ft. wide by 350 ft. long, with a covered loading platform running the full length of the building, from

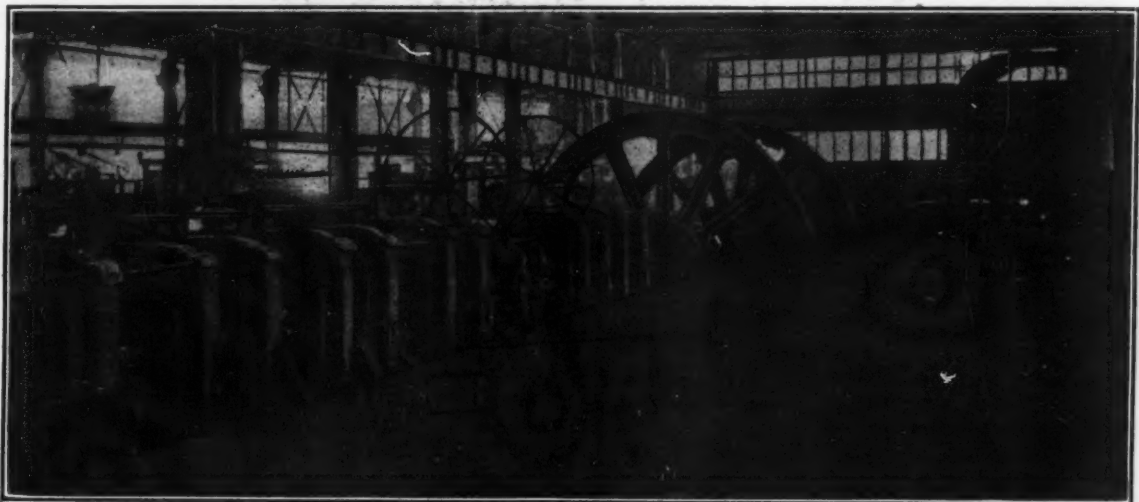


Fig. 5.—Some of the Sheet Mills.

which the cars are loaded in the usual manner. The roof over the shipping side of the sheet warehouse projects out for a space of about 15 ft., thus allowing sheets to be loaded without any interference. The officers of the La Belle Iron Works are as follows: Isaac M. Scott, president; W. D. Crawford, vice-president and general manager; H. D. Westfall, secretary and general manager of sales; W. B. Higgins, assistant secretary; R. C. Kirk, treasurer, and J. H. Gilmore, assistant treasurer and auditor. The company maintains selling agencies in the leading cities throughout the country.

Fire Danger in Fan Bearings.—The fire menace of the ordinary fan bearing, frequently overflowing with oil,

High Grade Forgings.

A brochure entitled, "Handbook of Steam Hammer Forgings," has been issued by the Driggs-Seabury Ordnance Corporation, Sharon, Pa. In this publication interesting information is given as to the company's facilities for the production of work of the United States Government standard of excellence. The equipment has been specially provided for meeting the specifications of the Navy Department for high powered guns and of the War Department for field material. This equipment therefore enables the company to supply its general customers with the same high standard. Views are given of the interior of the machine shop which not only indi-

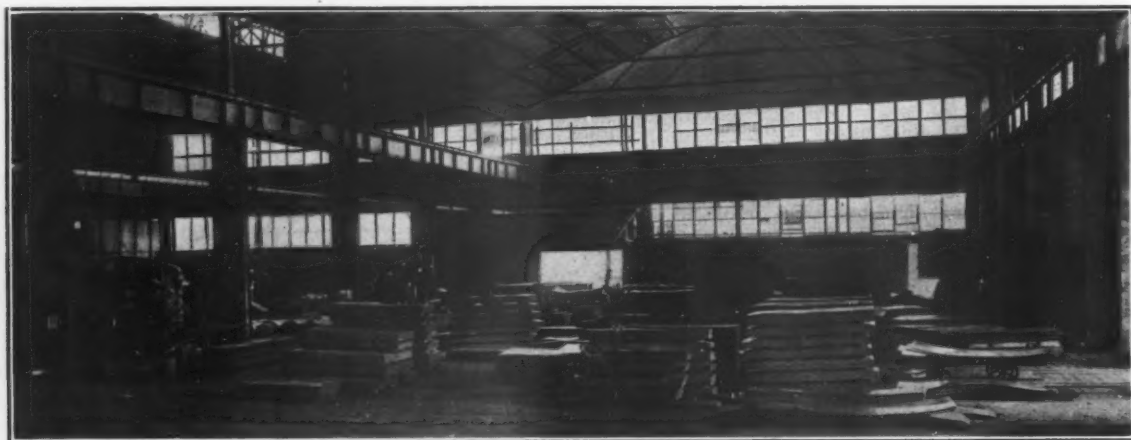


Fig. 6.—The Cold Rolls and the Annealing Furnaces.



Fig. 7.—The Sheet Warehouse.

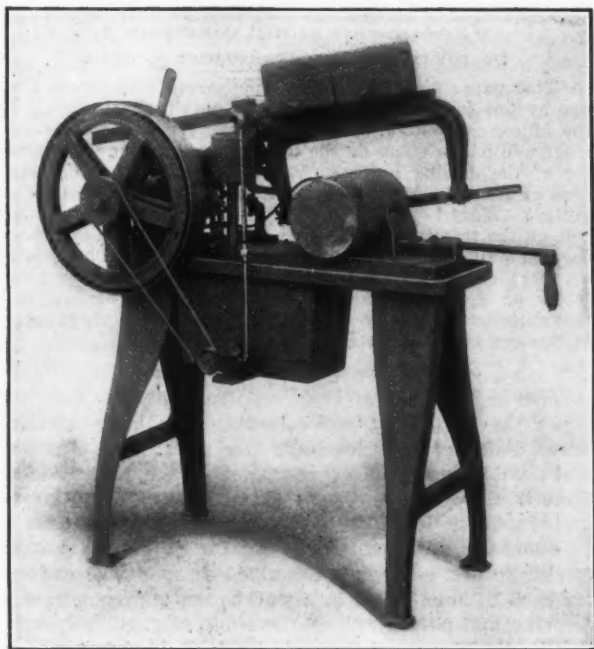
is recognized by the insurance companies. Various recommendations are made from time to time by inspectors and experimental bureaus looking to the elimination of this risk, especially where the materials in process in manufacturing plants are particularly inflammable and susceptible to ignition. The fan by its action is always in position to spread the flames. This danger should no longer prevail. From the crude journal to the ring oiled bearing a definite progressive step was made. But to-day the ball bearing is available, and already successfully applied in fan practice. With this type the presence of oil and collected dust is eliminated, overheating becomes impossible, and incidentally, but of great importance, frequency of attention is greatly reduced. Such a bearing if properly designed may run for six months without repacking. From every reasonable standpoint it appears that the ball bearing fan should supersede all others.

cate the character and extent of the company's facilities, but also show the class of work upon which it is engaged. Illustrations are presented of such forgings as guns, automobile parts and crank shafts, and of other products, including types of gears and drop forgings. The gear cutting equipment consists of the most recent automatic machines which cut teeth with scientific accuracy. The attention of users of gears is called to the company's special nickel steel gears, which are both hard and tough. The possession of both steam hammer and drop forgings departments enables the quality of material to be controlled and prompt deliveries to be effected. The drop forgings are made of plain, nickel or chrome nickel steel to prescribed physical qualities. Record of tests of crank shafts are given, which show remarkable strength. Tables are presented which are of interest to users of gears and of high class steel.

The Racine Power Hack Saw.

A hack saw especially designed for high cutting speeds and heavy service is a new product of the Racine Gas Engine Company, Racine Junction, Wis. The tool, as will be observed in the accompanying engraving, is equipped with a reservoir underneath the frame for the cutting compound, which is circulated by a rotary pump, belt driven from the main shaft. A channel cast in the frame receives the compound after being discharged upon the saw, and from thence it is returned to the tank to be used again.

Features of advantage in this saw which are particularly emphasized are its draw cut, the blade being pulled instead of pushed across the material, and its positive automatic lifting device, consisting of a ratchet bar and dog for lifting the saw on the return stroke. It is claimed that under a pulling cut a new blade can be started under



The New Power Hack Saw Built by the Racine Gas Engine Company, Racine Junction, Wis.

full pressure without injury and that heavy pressure can safely be applied to the blade. It is also stated that a 14-in. saw blade 1 in. wide by 0.032 in. thick has, under test, withstood a pressure of 80 lb. in a cut through 6-in. round steel bar, which was accomplished in 32 min. It is further claimed that by the use of compound the working speed is increased at least 100 per cent., with a reduction in cutting time from 10 to 40 per cent., according to the size and kind of material to be cut.

The machine is provided with a heavy flywheel surrounded by a metal guard and a convenient screw clamp for holding the work. All parts are made with jigs and templates and are therefore interchangeable. The saw guide, cast in the form of an I beam, 1 x 2½ in., is in one piece, on the lower flange of which the saw frame is carried. Provision is made for taking up wear on the guides to preserve the alignment of the saw. A special device in the form of an extension bar is supplied for holding blades varying in length from 10 to 14 in., and in keeping them square with the chuck. The saw has a capacity for cutting bars up to 6 in. round or 6 x 6 in. square.

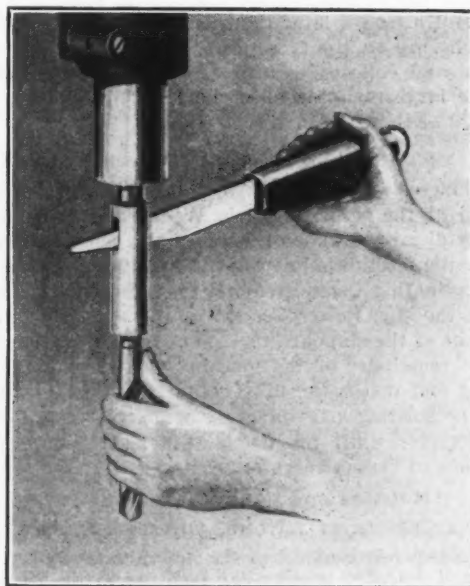
The Sirocco Engineering Company, New York, has been advised by the foreign attorneys for S. C. Davidson of Belfast, the original inventor and manufacturer of Sirocco fans, that a decision has been rendered in the suit brought by Mr. Davidson against the Siemens Schuckert Werke for infringement of his German patent for Sirocco centrifugal fans and blowers. This decision adds another to the chain of legal victories achieved by Mr. Davidson in every country and in every suit where

his patents for the Sirocco fans have come under adjudication. Following this decision a German company, the Sirocco Gesellschaft, has been formed for the manufacture of Sirocco fans, which are to be constructed at the works of the Allgemeine Electricität Gesellschaft.

The New Automatic Drill Drift.

The new automatic drill drift, manufactured by the Automatic Drill Drift Company, Springfield, Ill., is here-with illustrated. Though simple in the extreme, its thorough practicability and merit appeal to any one who is familiar with drill presses and their operating.

In construction it consists of a hardened and polished steel blade which is slidably mounted in a heavy cast iron handle, containing a very low tension coil spring by



The New Automatic Drill Drift.

which the blade is kept extended when not in use. In operating, as is shown in the illustration, the drift or blade is inserted in the drill socket and driven home by sliding the heavy handle up the blade until the base of the latter contacts sharply with the bottom of its socket, the impact of which is sufficiently great to extract even the most stubborn drill. The drift and driving mechanism being self-contained, only one hand is required to operate it, the other hand being free to hold the drill and prevent it from falling, as it invariably does when the ordinary method of driving a drift is attempted.

In size it is practically universal for ordinary purposes, fitting sockets Nos. 1 to 3, inclusive, thus adapting it to the demands of almost every shop. It is fitted with a ring at the end by which it may be attached with a chain to the press, where it will be always ready. The tool is supplied at an extremely low price by the company.

The United States Metal Recovery Company, which is erecting a plant near Elwood City, Pa., for extracting metals from various ores, recently completed one of its smaller buildings. Motor driven crushing, elevating and separating machinery is being installed, and this department will be placed in operation about July 10. Another building, which is nearing completion, will be used for manufacturing mantels used in gas lighting, the by-product from certain minerals being utilized in their manufacture. R. Daac, House Building, Pittsburgh, has charge of the engineering work.

The Ohio Iron & Steel Company states that it has no intention of starting its Mary Furnace at Lowellville, Ohio, at present. Some repairs and improvements are being made, but when the furnace will go in blast again is uncertain.

THE MECHANICAL ENGINEERS' CONVENTION.

Detroit Meeting, June 23 to 26, 1908.

In point of numbers in attendance, the fifty-seventh convention of the American Society of Mechanical Engineers held last week in Detroit, Mich., was the largest mid-year meeting in the history of the society. The previous issue of *The Iron Age* contained an announcement of the opening session Tuesday evening, June 23, at the convention headquarters, the Hotel Cadillac, where all of the subsequent professional sessions were held. The present report covers these and refers briefly to the simultaneous meetings of the Society for the Promotion of Engineering Education and the Society of Automobile Engineers, the former convening from June 24 to 27, and the latter from June 25 to 27. These two additional meetings and the holding of the mechanical engineers' meeting about a month later than usual, allowing those members who are on the faculties of the various engineering schools and colleges to attend, were largely responsible for the large registration of members and guests, which was 720 at the close of the meeting.

SECOND SESSION.

Business, which is always the first matter of consideration at the second session, Wednesday morning, was quickly dismissed and consisted of the report of the tellers on the election of new members, the appointment of the Nominating Committee and the adoption of a motion to ask the Gas Power Section of the society to propose revisions of the standard method of testing gas engines.

The remainder of the morning was given to the presenting and discussing of a collection of papers dealing with the hoisting and conveying of materials. Discussion was deferred until the five papers had been presented. Abstracts of these papers follow:

"Hoisting and Conveying Machinery."

BY GEORGE E. TITCOMB, PHILADELPHIA, PA.

This paper is confined to the intermittent type of apparatus and describes present day facilities in the mechanical transfer of materials, especially coal and ore, to and from shipping points and storage. Its numerous illustrations give striking evidence of the remarkable development of such machinery where the magnitude of the installation is as much a consideration as expeditious and economical operation. The paper deals with cargo steamers, loading wharves and ore unloading machinery on the Great Lakes, ore stocking machinery at furnaces, anthracite and bituminous coal storage machinery, covered anthracite storage, storage for locomotive coaling stations, machinery for loading and unloading coal from vessels, and freight handling. The equipment described includes open air and covered coal storage apparatus, traversing and revolving bridge tramways, locomotive cranes, hoisting towers and telfers.

"Continuous Conveying of Materials."

BY STAUNTON B. PECK, CHICAGO, ILL.

Only the conveying of materials by continuous machines is covered in this paper. Much experimental work has been done in the 30 years during which these have been developed, and much is still to be done. There has been a lack of published information on this subject. In contemplated installations the tendency is too often to select a style of conveyor that involves the least initial cost, although the wide diversity in the designs and details of this class of machinery allows choosing that which in any particular case will operate most efficiently. This paper aims to give a general idea of some of the types of conveyors in use, and data as to their adaptabilities, capacities, power consumed and economies effected. Following this some of the more systematic applications of conveying machinery are shown, with figures of the saving they have effected.

"The Belt Conveyor."

BY C. KEMBLE BALDWIN, CHICAGO, ILL.

To acquaint engineers who are designing plants with the possibilities of the belt conveyor for handling heavy abrasive materials, and give them data which will be of service in preparing preliminary designs is the purpose of this paper. The author claims the following for this type of conveyor: Large capacity with low power requirements, small maintenance charges, freedom from breakdown, light weight of mechanism for large capacities, contact of the material carried with the belt only, no necessity of absolutely perfect alignment, ability to assemble in light portable sections, and large overload capacity. Local conditions affect the choice of the proper width and character of belt, general arrange-

ment of conveyors, &c., and on these matters the specialist should be consulted.

"Conveying Machinery in the Portland Cement Plant."

BY C. J. TOMLINSON, NEPONSET, ILL.

Belt conveyors, screw conveyors, chain and bucket elevators and flight conveyors are those generally used in cement plants. Their advantages are low first cost and continuous and automatic operation, and their disadvantages rapid wear, low mechanical efficiency and lack of proper measuring arrangements. The conditions in these plants are trying, and results indicate that a heavier, simpler device should be adopted, and one that includes convenient means of recording the performances of the machinery served. Devices similar to the blast furnace skip-hoist and scale transfer car are suggested, which, however, involve radical changes in the design of the plant.

"Performance of Belt Conveyors."

BY EDWIN J. HADDOCK, COLUMBUS, OHIO.

This paper gives details of experiments made some time ago by the Jeffrey Mfg. Company to obtain data relating to the following points: Other conditions remaining the same, what will be the effect on the traction of changing the diameter of the driving pulley? What is the effect of different arcs of contact on the tractive force exerted by the driving pulley? What is the effect of different initial tensions of the belt on the tractive force? And what is the value of rubber covered pulleys as compared with plain ones? The results of these experiments are given, in some cases by curves, tables or equations deduced. Conclusions are drawn and recommendations made with regard to the foregoing points in connection with belt conveyors.

Discussion of Conveyor Papers.

Melvin Pattison gave as supplementary to the first paper the records of ore unloading machinery at Conneaut, Fairport and Cleveland. He referred also to several notable coal handling equipments. He declared that there is a growing sentiment for man trollies and larger grab buckets.

George B. Willcox, discussing Peck's paper, and referring to belt conveyors, described scraper type conveyors used to handle salt in a warehouse, and submitted a drawing and photograph of the equipment.

Charles Plez noted the omission in Baldwin's paper of mention of the Robins patent belt conveyor. He discussed principally the different methods of troughing the belt, and gave details of the design and construction of belt conveyors and how to care for them. He advised avoiding unnecessary turns, and especially counterbends in the belts. The driving mechanism he maintained should always be placed at the head end of the conveyor. He referred also to Baldwin's formula for finding the horsepower required by a conveyor and to two other formulas given in other papers, calling attention to the fact that they were all different. One formula, he believed, should be agreed upon that would give satisfaction without calling for special expertness in the person using it.

T. A. Bennett submitted a discussion for A. B. Proal which compared belt and bridge conveyors, with special reference to the former. He showed samples of steel, cast iron and various kinds of conveyor belt all of which had been subjected to a sand blast for 45 min. In proportion to the depth of the abrading, rubber belt was 1, steel $1\frac{1}{2}$, cast iron $3\frac{1}{2}$, woven cotton 5, stitched cotton 8, and woven cotton of low quality 12. He emphasized the diversified materials which can be handled by conveyors.

E. H. Messiter suggested a modification of Baldwin's formula for conveyor belt horsepower. He also believed it would be desirable to have a uniform formula, and proposed one.

James M. Dodge of the Link Belt Company paid a pretty tribute to C. W. Hunt of the company of the same name, stating that the equalizer invented by him (Dodge) was not the first, and that where his associate, Mr. Peck, had declared for the need of greater excellence in the quality of product, it was not an inference that it was not now on the market. He averred that it is the Link Belt Company's ambition to emulate the C. W. Hunt Company in that regard.

Prof. R. C. Carpenter, referring to Tomlinson's paper and the conveying of Portland cement, explained that conveying machinery which in other industries stands the work soon goes to pieces in handling cement, and stated that it pays to put in very heavy machinery. He had drawn the conclusion from the paper that the author intimated that screw conveyors are very little used in cement plants. His experience is that they are used for about 90 per cent. of this work. As a rule it is not the ordinary screw conveyor, but one of some special design. In his opinion belt conveyors are not very good for cement work, and the cost of repairs is high. Steel cars with cables had not been mentioned in the paper, but he regards them as very useful in cement mills.

A written discussion was submitted by E. S. Fickes, which remarked that Mr. Peck's paper did not mention inclined tube conveyors which are made with or without an inside helicoid, and outlined details of such a conveyor that can be modified to adapt it to various conditions. It is suitable for almost any materials except those that are too lumpy or tend to pack together.

E. G. Thomas referred principally to Baldwin's paper and gave an illustration of a spiral spring used in place of troughing idlers on a belt conveyor. The spring has about two coils per inch of belt width and wire of a tensile strength of about 15,000 lb. per square inch. The spring is designed so that with the conveyor under full load its deflection is about the same as with idlers at 35 degrees, where three troughing idlers are used.

Prof. H. W. Hibbard believed that the information brought out at this meeting would interest the railroads. They are anxious to get the best type of coal handling apparatus. The speaker considered that the equipment for coaling locomotives may be developed farther. Much depends on its capacity and reliability.

W. T. Donnelly drew attention to a form of conveying not alluded to in any of the papers or the discussion—conveying by running water, of which hydraulic dredging is an example. By this means objects of considerable size as well as sand can be conveyed, and it is an economical process. Professor Hibbard thought as closely akin to this compressed air should be mentioned. H. H. Supplee mentioned the removal of ashes from vessels by pumping out with injectors as a practical illustration of conveying by water. Prof. William Kent referred to a projected scheme of the same sort in the experiments of the late W. S. Andrews on the conveying of anthracite coal by water. It was proposed to deliver the coal from the mines to the plant, about 200 miles, but the plan has not been carried out since the death of the promoter. W. H. Blauvelt also cited the use of a strong stream of water for carrying away slag, a practice which is some 15 years old.

Authors' Closures.

G. E. Titcomb gave more in detail concerning some of the apparatus referred to in his paper. S. B. Peck spoke further of flat and troughed belt conveyors. A previous speaker had said that if a flat belt had capacity enough why trough it? In answer to this Mr. Peck explained that there is a tendency from wind currents and vibration for material to work to the edge of a belt and dribble from it. Pivoted conveyors, he considered, have a place where the proposition involves elevating material, as they elevate as well as convey. He did not agree with the conclusions of Tomlinson's paper with regard to conveyors for cement plants, and also replied to Professor Hibbard's preference for cars and trestles in locomotive coaling as more reliable than continuous conveyors, stating that where uninterrupted service is demanded conveyors can be installed in duplicate and used alternately, and that he had known of many instances where trestles had been disastrous from cars running backward or over the ends.

C. K. Baldwin defended his formula for the horsepower required by belt conveyors, as one developed from a great many experiments and used for over five years, during which it had proved all right. A number of conveyors based on his table for the diameters of pulleys suitable for given belts are in satisfactory operation. He still maintained also that a conveyor can be driven from any point in its length and not necessarily from

the head end. E. J. Haddock in reference to the diameters of pulleys for belt conveyors agreed that the number of plies in the belt should determine the minimum diameters of pulleys over which the belt passes. He believed that belts should be protected on the inner or driving side, as well as on the carrying side.

THIRD SESSION.

Miscellaneous subjects were considered at the Wednesday afternoon session. The first paper was presented in the absence of the author by Prof. L. P. Breckenridge. An abstract follows:

"The Thermal Properties of Superheated Steam."

BY PROF. R. C. H. HECK, LEHIGH UNIVERSITY.

The paper made a graphical comparison of the data from the experiments of Knoblauch and Jakob and of Thomas on the specific heat of superheated steam under constant pressure. This shows a marked difference near the point of saturation. The author explains conditions at this point and finds evident errors in the interpretation by Knoblauch and Jakob. Views are given of the critical state of water and a new interpretation is made of Knoblauch and Jakob's results, bringing them into essential agreement with the work of Thomas. The author treats of the higher range of superheat, referring to experiments of Holborn and Henning, and gives a combination of data derived graphically showing the probable manner of variation of specific heat. There is a table for superheated steam, giving specific heat, heat added above saturation and entropy above saturation. Other data are also referred to, with several comparisons and a statement of the general considerations involved. As Professor Breckenridge explained, this paper has endeavored to take the results of all earlier experimenters and deduce from them the truth.

A discussion by Prof. W. D. Ennis, Polytechnic Institute of Brooklyn, was submitted by A. L. Rice. The writer agreed that the question of the specific heat of superheated steam is now about settled. He believes that if the same temperature for the higher degrees of superheat had been used by the German experimenters the same results would have been reached as by Thomas.

Another prepared discussion in the absence of its writer, Dr. H. N. Davis, was offered by Prof. L. S. Marks, Harvard University. It had to do with the lower ranges of temperature and compared the results obtained by Knoblauch and Jakob and by Thomas. He compared the methods of the two and pointed out advantages in those of the former. The Thomas method of determining when the steam is saturated was criticised as being not necessarily a true indication, and this would explain the higher values for superheat at low ranges of temperature found by Thomas. Dr. Davis submitted a series of curves correcting the results of the two experimenters. He also criticised the treatment in the neighborhood of the critical state.

Prof. H. T. Eddy of the University of Minnesota submitted a set of diagrams which he had plotted for his own convenience, with the aid of which he compared the results of the different experimenters. Thomas' results he considered to be straight lines, within the limits of practice. These curves enable judging somewhat of the value of these results in relation to one another. He also referred to the paper read by A. R. Dodge on "The Specific Heat of Superheated Steam," at the Indianapolis meeting one year ago. Concerning Thomas' conclusions Prof. Eddy considered that he had taken liberties with his experiments. It is Prof. Eddy's idea that superheated steam can be regarded as a gas, but a different gas for each pressure. In this connection H. H. Supplee referred to gas turbines, in which the gas is cooled by the admixture of steam which then becomes a gas, and declared that knowledge of the specific heat at very high degrees of superheat would be useful.

The secretary, in the absence of the author, read the next paper, an abstract of which follows:

"A Rational Method of Checking Conical Pistons for Stress."

BY PROF. GEORGE H. SHEPARD, SYRACUSE UNIVERSITY.

On account of the differences in form of conical pistons of different design, the author explains that it is impossible to deduce a general formula, but the method explained for the form of piston selected may be used to work out the stress in any other form. The mathematical development of the formula is explained step by step. While the equation is too complicated to permit of direct design for dimensions,

it may be used to check up a trial design. The equation shows that the stress at any point varies nearly as the square of the thickness at that point so that the design, if at fault, can be readily corrected. The discussion deals only with pressure on the hollow side of the piston, but as this is more than likely to be the side on which it is the weakest, it is safe to assume the piston strong enough for pressure on the opposite side if properly designed for inside pressure. The uniformly distributed stress can nearly always be neglected.

A written discussion, prepared by M. Nusim, was offered for him by George A. Orrok. It called attention to the fact that Shepard had not taken into account the force acting parallel to the slant height of the cone as a component of the force acting parallel with the axis of the piston rod. In justice to the author who was not there to reply, it is probably safe to say that he had regarded this as one of the stresses of such small magnitude in comparison to the others that it could safely be neglected when sufficient strength was provided for the other stresses.

The author of the next paper was also absent and Prof. C. H. Benjamin of Purdue University presented it in abstract. The following gives the substance of the paper:

"A Journal Friction Measuring Machine."

BY HENRY HESS, PHILADELPHIA, PA.

This paper describes a machine for testing bearings, particularly ball bearings, under various loads and speeds, with the loads applied normal to, or parallel to the shaft, or both. Radial loads up to 15,000 lb. and axial loads up to 10,500 lb. can be applied under speeds from 150 to 2500 rev. per min. and the co-efficient of friction measured under any of these conditions. The principle of the machine is explained, its use, methods of taking observations, and formulas for calculating results. Merely to illustrate the range and accuracy of the machine, but not to discuss friction tests, curves from typical tests are given. The machine was designed by the author and built by the Riehle Brothers Testing Machine Company, Philadelphia, Pa.

J. R. Peirce discussing this paper, believed that the friction of ball bearings is not as important as their reliability, but considered that the Hess machine will be of great value in detecting inferiority in bearings on the market. He thought that it would be interesting to have all bearings at present made tested on this machine. He also gave interesting facts from his own experience in the use of ball bearings under rather remarkable and unusual conditions of load and speed.

Dr. Brashear asked what was the earliest date of the use of ball bearings. He had recently taken apart a telescope built in 1859 having a bearing in which there were $\frac{5}{8}$ -in. balls. All astronomical telescopes are now built with ball bearings.

Professor Benjamin stated that his experience with journal friction testing machines, not those designed to test ball bearings, is that all are too complicated. He believed that there is still room for improvement.

This session was concluded with the announcement by the secretary that the Semet-Solvay Company had extended an invitation to visit the Delray plant in the southern part of the city as of probable interest in connection with the paper on the by-product coke oven to be presented at the Thursday afternoon session.

THE S. P. E. E. SESSION.

Simultaneously, the Society for the Promotion of Engineering Education was holding a session in another part of the Hotel Cadillac, the programme of which included:

Report of the Joint Committee on Engineering Education, by Prof. D. C. Jackson, Massachusetts Institute of Technology.

"The Course in English in Technical Schools," by Prof. J. M. Telleen, Case School of Applied Science.

"Results of an Experiment in Teaching Freshmen English," by Dean William Kent, Syracuse University.

"A Proposed Course in General Engineering," by Harwood Frost, secretary *Engineering News*.

"Present Curricula of the Mechanical Engineering Courses," by Prof. W. T. Magruder, Ohio State University.

"The Correlation of Courses in Engineering Colleges," by Gardner C. Anthony, dean of department of engineering, Tufts College.

WEDNESDAY EVENING LECTURE.

In the Y. M. C. A. Building Wednesday evening the various societies jointly enjoyed an extremely interesting lecture by Prof. John A. Brashear, astronomer and scientist, Allegheny, Pa., on "Contributions of Photography to Our Knowledge of Stellar Evolution." The lecture was illustrated with some very remarkable pictures that became the more impressive when the professor explained that the objects photographed were in many cases millions upon millions of miles away, and may have ceased to exist centuries before their light reached us.

EXCURSIONS.

The entertainment provided by the Local Committee was almost too attractive for the good of the attendance at the professional sessions. For several trips to local factories were made while these sessions were in progress, among them the Ford Motor Company, Packard Motor Company, Burrough's Adding Machine Company and the Semet-Solvay Company. The ladies were unusually well provided for in luncheons and excursions, so much so that they independently voted a resolution of thanks at the close of the meeting on Friday. An excursion in which all could participate was the one Thursday morning when there was no professional session. A steamer was taken to witness the launching of the 10,500-ton steamship William B. Meacham at the yards of the Great Lakes Engineering Works, at Ecorse, on the Detroit River. It had been expected that on the return trip the party would see the sinking of the fourth section of the Detroit tunnel, but this was delayed by the foundations not being ready.

FOURTH SESSION.

Thursday afternoon the American Society itself had two sections in simultaneous session. One under the charge of the Gas Power Section of the society, at which papers of interest to those in that field were given, and another section at which miscellaneous papers were considered.

Gas Power Section.

Dr. Charles E. Lucke, president of the section, and Henry H. Supplee, secretary, presided. This was the first meeting of the Gas Power Section at a semiannual meeting. Business was first in order, consisting of reports of Membership, Meeting and Standardization committees. The latter has to do with the methods of rating, specifications, guarantees, &c., of engines and producers, and reported progress. Communications relative to this subject were read from J. R. Bibbins, H. F. Smith, J. B. Plump and Arthur West; also a letter from the National Fire Protective Association, asking that members of this section furnish information regarding the storage and handling of gasoline to decrease the fire risk.

Taking up the papers, the first one read was

"The By-Product Coke Oven."

BY WILLIAM H. BLAUVELT, SYRACUSE, N. Y.

Briefly outlined, this paper discussed coke, what it is, what constitutes good coke, how it is made in the various types of ovens in use in this country, described the beehive and various retort ovens—Otto-Hoffman, United Otto, Semet-Solvay, Rothberg and Koppers—the superiority of retort ovens in the recovery of by-products, the methods of charging and withdrawing, and among mechanical devices the combined stamper and coke pusher, and incidentally referred to an oven plant designed under the author's direction; explained the uses of various by-products, gas, tar, ammonia and benzol, the methods of their extraction and refining, and gave analyses and yield of gas from low and high volatile coals. In part, the author's conclusions were that the development of the by-product coke oven in this country has been relatively slow because the chemical industries have not kept pace with the sources of their raw materials and because of the expense of installing by-product coke ovens; that the prospect of increasing demand for the by-products is encouraging—gas not only for illuminating but for power—tar and pitch for briquetting coal, creosoting wood and sprinkling roads—ammonia for commercial and household uses, fertilizers and other chemical products—and benzol, both alone and with alcohol, as a motor fuel; and that "the production of coke at the blast furnace plant, where the operation is assured by large storage of coal and where the labor is under better control than in less developed regions, is in line with to-day's manufacturing methods. The higher economy of the by-product coke oven's operation.

its special adaptation to control by the modern scientific organization, the ability to draw coals from several fields, and the successful adaptation of labor saving appliances to its various operations, all point to its being the oven of the future."

In presenting his paper the author, instead of reading an abstract of the paper, gave a little historical introduction to it.

J. R. Bibbins, discussing this paper, described briefly an installation of gas engines at Lebanon and spoke principally on the utilization of its by-product gas. C. M. Barber considered the paper a valuable contribution to our knowledge of coke manufacture. He gave it as his opinion that cooling is a better term for quenching the coke when withdrawn, as it is not then combustible in air. It can be cooled in air on conveyors, to illustrate which the speaker gave a diagram of a suitable conveyor and described its operation and use. As objections to quenching or cooling coke with water he maintained that it cracks the coke and results in a great amount of breeze. A better grade of coke is produced by air cooling, which soon offsets the cost of installing the conveyor. A discussion by C. G. Atwater took principally the form of submitting statistics relative to the production of coke, and its various by-products, during the year 1907, showing the gain over previous years.

It was asked if the trouble from sulphur in gas comes from the condensation of this impurity on the gas engine rods due to their water cooling. Mr. Bibbins replied that no trouble results if the sulphur and water are kept apart. Prof. R. H. Fernald repeated the statement he has made at other times before the society that in the experiments at the St. Louis fuel testing plant they ran all fuels with as high as 8½ per cent. sulphur, and experienced no trouble in using the gas in gas engines without passing it through a scrubber to remove the sulphur. A purifier was used for a short time, but gave more trouble than was had when its use was discontinued. G. J. Rathbun stated that he had recommended in one case where sulphur in the gas resulted in dry spots on the rod, that hot instead of cold water be passed through the rods. When this was done the trouble ceased.

In closing the discussion on his paper Mr. Blauvelt stated that he hoped that the conclusions from the St. Louis experiments that sulphur in gas does no harm will find foundation in fact. He does not expect to see sulphur purifiers a regular part in a gas engine installation.

A resumé of the next paper follows:

"Power Plant Operation on Producer Gas."

BY GODFREY M. S. TAIT, NEW YORK.

Experience with gas producers for engine operations has brought out the following facts: Owing to the high percentage of fusible ash in American fuels European data as to sizes of producers and general design are for the most part misleading when applied to American conditions. While low rates of gasification obviate clinker troubles, the incident low temperatures interfere with the complete dissociation of the steam in the draft, and consequently cause a great range of variation in the amount of hydrogen in the gas, when the load on the plant varies. As the variation in percentage of hydrogen affects the ignition point of the gas it seriously affects the regulation of the engines. A simple and satisfactory remedy for these conditions tried by the writer was the elimination of the moisture in the draft (and consequently the hydrogen in the gas), thus making a gas of an absolute fixed value and having one ignition point under all conditions.

C. W. Lummls, in discussing this paper, described what was done in the practice of the Camden Iron Works. He thought that the bad feature of the gas exhauster was the introducing of the necessity of a water seal. H. F. Smith declared that Mr. Tait had put his finger on the weak point in producers for gas power, and offered a scheme for removing the difficulties. E. P. Coleman of the Lackawanna Steel Company talked of the trouble which that company had had in an open hearth steel plant where they tried to run on producer gas. C. J. Davidson explained that when in Europe he could not find any success with the use of bituminous coal for operating gas engines, and desired to know if there were any records of successful plants of that character in this country. H. W. Peck did not think that an expert steam engineer was as good for operating a gas plant as a

mechanic who had not any special knowledge of steam engine practice. F. H. Stillman explained that he had acted on similar advice with evident benefit.

In the author's closure he explained that the exhauster described in his paper is not a part in the process, but a suggestion for operating engines in parallel. His discussion was based on anthracite practice only. He agreed that good machinists, since they have nothing to unlearn, make the best operators.

An abstract of the third paper follows:

"Horse Power, Friction Losses, and Efficiencies of Gas and Oil Engines."

BY LIONEL S. MARKS, HARVARD UNIVERSITY.

Indicated horsepower and the efficiencies derived from it are of little use in comparing the performances of different gas engines. Indicated work in the four cycle engine is the difference between the total work done by the gas and the gas friction work of getting the gas into and out of the cylinder. These two components should always be determined separately, and thermodynamic efficiencies should be calculated from the total work. If total horsepower, gas friction horsepower, machine friction horsepower, thermodynamic efficiency, engine efficiency, mechanical efficiency and net efficiency are determined, they will permit really useful comparisons between engines of different types and between any engine and the ideal.

Instead of presenting his paper in abstract the author explained it. In his conclusions he referred to a German discussion, that Secretary Supplee will abstract for printing in the *Proceedings*, and, answering a question that had been asked—what compression would he recommend for illuminating and producer gas engines?—he replied that the practice is so variable he would not like to make a statement.

"A Simple Method of Cleaning Gas Conduits."

BY W. D. MOUNT, SALTVILLE, VA.

The means developed to clean the conduits leading from a battery of gas producers to heating furnaces without interrupting operation are described in this paper. Most bidders on the installation had offered as the best possible not more than a few hours shut-down each week to remove the accumulated soot in the conduits, but this was not allowable. A duplicate conduit system was proposed, but lack of space precluded this. Finally the Morgan Construction Company, Worcester, Mass., designed a system which would not require more than 15 min. shut-down, which, it was presumed, would not seriously impair the heat of the furnaces. This system as installed provided openings for cleaning out the soot by a jet of steam (compressed air was used instead), but even 15 min. shut-down proved too great. The scheme was further developed, and as now in operation is entirely successful. Frequent openings are provided in the upper side of the conduits, stopped by plugs which can easily be removed to insert a bent iron pipe with ball joint surrounding it to stop the escape of gas while the pipe is inserted, to blow the soot along toward the furnace. Clean out holes, except in the drop legs, were found unnecessary, as the soot blown forward into the furnaces is almost wholly consumed. It is not necessary to shut off the gas at all, the producers do not seem to be affected, and the conduits are thoroughly cleaned down to the brick lining.

This paper passed without discussion, and the author was not present to offer anything further.

General Section.

This section, which convened simultaneously with the gas power section, first gave attention to the paper:

"The Surge Tank in Water Power Plants."

BY R. D. JOHNSON, ALBANY, N. Y.

This paper treats of the momentum of flowing water in long pressure pipes for the supply of hydraulic turbines or impulse wheels and of the control of rate of flow by modifying the momentum in such manner as to obviate harmful effect upon speed regulation of the water wheels, without waste of water through relief valves, deflecting nozzles or bypassing it, as has usually been thought unavoidable where pipes are long, velocity great and pressures high. This is accomplished by a surge tank near the down stream end of the pressure pipe, atmospheric or under compressed air. The paper treats of the size of surge tank needed under various conditions of velocity, size and length of the moving water column, and presents a novel device by which the diameter (or area) of the tank may be reduced about one-half, thereby lessening its cost and at the same time improving the pressure regulation for speed control. This device, the differential regulator, may work open to the air or under compressed air where head is high and support lacking. The design of the regulator is fully set forth in its mathematical relation to the balance of the plant.

A discussion offered by L. F. Harza reduced certain of Johnson's equations to more simple form. Discussing surge tanks he considered friction and made different assumptions. The author had worked out a problem with these equations and Mr. Harza did the same. Not including friction the two compared well; including friction, governor, &c., they did not agree at all. Mr. Harza did not think favorably of the differential regulator referred to in the paper.

Prof. I. P. Church submitted a discussion in which he stated that there was serious error in the assumptions in the author's paper and offered his corrections for a certain part in the formula. He complained that Johnson had considered the whole pipe line as a water pendulum and that he did not consider the leakage at the bottom. In closing, Mr. Johnson insisted on the integrity of his formula by giving the reason that difference in level justified his formula.

Of the next two papers, abstracts of which follow, the first passed without discussion.

"Some Pitot Tube Studies."

BY PROF. W. B. GREGORY, NEW ORLEANS, LA., AND PROF. E. W. SCHODER, ITHACA, N. Y.

The distribution of velocities and pressures of flowing water were determined in straight and curved portions of pipe. A study of the indications of a Pitot tube, both with the impact opening facing the current and reversed, in straight pipe with normal elliptical velocity distribution, gave a means for finding the true velocities and the relative pressures throughout cross sections in a curved portion of the pipe where the flow was distorted. There is given a convenient method of making Pitot tube traverses in straight pipe. The modified indications of static pressure by the static openings of a Pitot tube due to suction action are explained.

"Comparison of Screw Thread Standards."

BY AMASA TROWBRIDGE, HARTFORD, CONN.

A diagram is submitted in this paper to show what is possible or impossible in combining the present recognized standards for screw threads. On this are curves comparing the Pratt & Whitney standard thread for machine screws, the United States standard thread and the standard of the Association of Licensed Automobile Manufacturers, with the standard recommended by the Machine Screw Committee of the American Society of Mechanical Engineers. The latter is recommended because of its uniform proportions for sizes below 7-16 in. diameter and the United States standard for larger sizes. The standard of the automobile manufacturers is adapted only for the special use intended.

Discussing this paper, L. D. Burlingame declared that the United States standard threads are too coarse for small threads, and commended the new A. S. M. E. standard for screws below 7-16 in. He derived a formula which follows the A. S. M. E. standard up to 5-16 in., and beyond that is sort of a mean between this and the A. L. A. M. standard. A motion was passed to take up this question and revise the society's present standard.

The last paper in this section was in substance as follows:

"Identification of Power House Piping by Colors."

BY WILLIAM H. BRYAN, ST. LOUIS, MO.

The number, extent, and variety of pipe lines in modern power plants have become so great as to lead to confusion, resulting in uncertainty, delay and occasional accident. A beginning has been made toward the quick identification of such lines by coloring them, further subdivision being secured by giving the flanges a different tint. The value of some such plan in emergencies, and to supervising engineers and inspectors, is evident. The author discusses the situation fully, and gives a list of schemes already in use. He recapitulates the requirements of the case, and believes that the time is ripe for concerted action looking to the establishment of a uniform, standard, and widely applicable color scheme for this purpose.

The suggestion was made by G. E. Mitchell that arrows be used to indicate the direction of flow in pipe, and that darker colors be used for distinguishing mains in the boiler room, since there they get dirty quicker. He emphasized as important that manufacturers should either make all valves open the same way or that they should be plainly marked to show which are the opening and closing directions. F. W. Salmon claimed that any system adopted should be national, or better, international, and that special rates should be made by insurance companies for plants which have such systems in use.

It was moved by J. W. Leib that the council take up this subject and appoint a committee for working out a standard.

S. P. E. E. SESSION.

Simultaneously the Society for the Promotion of Engineering Education was holding a session in another part of the hotel. The programme of which follows:

President's address, "The Function of the Engineer in the Conservation of Natural Resources of the Country," by President Charles S. Howe, Case School of Applied Science.

"Adapting Means to the End in Technical Education," by Arthur L. Rice, Chicago.

"The Place of Foreign Languages in the Curriculum of the School of Engineering," by Prof. Arthur L. Wright, Case School of Applied Science.

"Second Degrees for Graduates of Engineering Courses," by Prof. W. F. M. Goss, University of Illinois.

"Scholasticisms in Engineering Education," by Prof. John P. Jackson, Pennsylvania State College.

"Concentration of College Work on a Smaller Number of Subjects," by Milan R. Bump, New York.

THURSDAY EVENING RECEPTION.

The members of all the different societies were invited as the guests of the American Society of Mechanical Engineers to its reception in the Hotel Cadillac. This was followed by dancing and a collation.

S. A. E. MEETING.

Thursday evening there was also in progress the opening meeting of the Society of Automobile Engineers, at which the following papers were presented:

"Autogenous Welding and Its Application to Automobile Construction," by E. S. Foljambé.

"Some Recent Developments in Magneto Ignition," by Otto Heins.

"The Storage Battery in Automobile Work," by Bruce Ford.

"The Unit System of Power Transmission in Automobiles," by Frank Beemer.

"Increased Efficiency of Single Motor Drive," by A. L. Dixon.

The demonstrations given in connection with the first paper were particularly interesting, and attracted many members of the other societies to this meeting. The Linde Air Products Company, Buffalo, and the Davis-Bournonville Oxy-Acetylene Development Company, New York, had furnished apparatus for the demonstration, and a number of welds were made by the oxy-acetylene blow pipe, and some pieces of steel cut by means of an auxiliary jet of high pressure oxygen. This meeting was held in the Hotel Tuller, which was the headquarters for the Society of Automobile Engineers.

FIFTH SESSION.

Friday morning the American Society of Mechanical Engineers held its last professional session. The first paper was a collection of data from

"Economy Tests of High Speed Engines."

BY F. W. DEAN AND A. C. WOOD.

These tests were made of the following engines and generators: A 14 x 15 in. 240 rev. per min. horizontal single flat valve engine with a 100-kw. direct current generator on the shaft; a 15 x 16 in. 240 rev. per min. vertical single flat valve engine with two 50-kw. direct current generators on the shaft; a 14 x 12 in. 300 rev. per min. horizontal single flat valve engine with two 40-kw. direct current generators on the shaft; a 16 x 14 in. 270 rev. per min. horizontal engine with four flat valves, and having a 125-kw. alternating current generator on the shaft; a 12 and 19 x 14 in. 230 rev. per min. vertical cross compound condensing piston valve engine with a 100 kw. direct current generator on the shaft; an 18 x 18 in. 220 rev. per min. horizontal single piston valve engine with a 150-kw. direct current generator on the shaft; a 15 x 16 in. 250 rev. per min. horizontal single piston valve engine with a 100-kw. direct current generator on the shaft, and a 12 x 18 in. 190 rev. per min. horizontal engine with two flat inlet valves and two Corliss exhaust valves, and having a 75-kw. direct current generator on the shaft. The object of the tests was to determine the steam used per indicated horsepower hour and per kilowatt hour, and also the efficiency of the set, as shown by the ratio of the indicated horsepower to the electrical horsepower at the switchboard. The engines were put in order for the tests. The usual methods of determining power and water were used.

A written discussion of this paper was submitted by C. A. Dawley, who considered that the tests were interesting as a collection of isolated tests on automatic engines under various conditions of type, size, speed,

load, steam pressure, steam quality, back pressure, overrating and underrating. He believed that the number of engines tested, seven, was not sufficient to draw any sweeping conclusions. The poor results were credited mainly in the paper to valve leakage, but the writer gave instances to show that piston leakage, a factor usually neglected in investigations of causes for lack of expected economy in steam engines, should be considered. R. H. Rice also thought that the author's results were interesting for individual cases. He considered the society fortunate in obtaining such accurate and satisfactory tests on non-condensing engines, because they are usually difficult to obtain; facilities are not often at hand for accurate tests. The tests showed that refinement, such as small clearance, prompt valve action, accurate adjustment of compression, &c., are of little importance until the greater loss of valve leakage is decreased. He believes the poppet valve the best for all classes of engines where the speed of the engine is sufficiently low to permit the valve to seat without noise or shock, eliminating, as it does, all rubbing surfaces from the valve itself. From steam turbine experience it has been found that single poppet valves remain tight and double poppet valves, if designed to be free from differential expansion with their seats, are also likely to maintain tightness. Reciprocating engines have higher water rates than equivalent turbines. R. C. Stevens showed a valve which the maker guarantees to remain steam tight for five years. He gave what he believed is the best record for an engine of its type. He expressed wonder that engineers do not insist when asking for guarantees that the engines maintain their economy in prolonged operation.

John C. Parker believed that many plants owe their lack of economical operation to careless attendants; in different men are given too many duties. Referring particularly to small plants such as office buildings, he had found that it is advisable to improve the all-year efficiency by cutting down the grate area. He considered that small plants might pool their interests, using a central plant for their load; a number of them can then together maintain a single plant, otherwise it is better to purchase current from a central station or a public supply.

F. A. Halsey described a double poppet valve used on the Nordberg engine in this country. He will submit a sketch of it later for the *Proceedings*. G. A. Young had tested five different types of engines and gave a report from some of his own tests. Prof. W. F. M. Goss considered that the results of this paper may surprise many. He explained that highly articulated engines may be all right if proper attention is given to their maintenance. Operators of such high speed engines ought to give them more care.

At this point the secretary made a request that the members of the society be particular in making their tests to be very accurate and to give the society the benefit of their results. In this President Holman seconded him. The president remarked that different engines tested in different places give different results. In pioneer plants he believed poppet valves likely to be the best because they will better stand wear from sand and grit carried along in the steam.

"Air Leakage in Steam Condensers."

BY THOS. C. M'BRIDE, PHILADELPHIA.

The author of this paper advocates measuring, by air pump displacement and temperature, the amount of air passing through a condenser, and comparing this amount in different condensers on the basis of its ratio, by volume, to the steam being condensed. The amount of air passing through condensers, as presupposed by manufacturers' ratings of air pumps, is calculated, and $4\frac{1}{2}$ volumes of air per 10,000 volumes of exhaust steam is established therefrom as the average maximum amount these ratings allow. The paper includes curves showing the theoretical relationship of the volume of air while in the exhaust pipe and after it has reached the air pump suction pipe. Tests are cited showing widely different air leakages, the leakage in one case amounting to about 18 volumes and in another to from two to three volumes of air per 10,000 volumes of exhaust steam. The paper recommends that in testing condensers engineers measure the amount of air on the basis suggested, and publish their results in order that the amount of air anticipated by ordinary practice may be established.

A. L. Rice presented a discussion for C. A. Howard on this paper. It was the writer's opinion that too much is put on the condenser manufacturer because large amounts of air leakage may come through the piping for which the piping contractor should be responsible. The present methods of constructing glands of steam turbines makes their leakage inconsiderable. C. L. Helsler agreed with Howard that the condenser builder must not be expected to guarantee too much without having any control over the tightness of the piping. It appears to be extremely difficult to find out how much is the leakage throughout the system and from where it comes.

The last paper of the morning was presented in abstract for the author by Charles B. Hayward, secretary of the Society of Automobile Engineers. This paper,

"Clutches, With Special Reference to Automobile Clutches,"

BY HENRY SOUTHER, HARTFORD, CONN.,

was submitted at the monthly meeting of the society in New York, Tuesday, May 12, and was printed in *The Iron Age* May 14.

A discussion of this paper was offered by Frank Mossberg, which was confined to positive clutches, such as those used on power presses. The speaker submitted a number of illustrations of different types of such clutches and described them, including one of his invention.

F. Du P. Thomson described the Wheeling Mold & Foundry Company's clutch, which was illustrated in *The Iron Age* June 11.

C. W. Hunt added data concerning the coefficient of friction in friction clutches. He stated what are the conditions necessary for designers to know, and disagreed with the author that theory does not enter into clutch design, for it should. He gave details of clutches used by different manufacturers, particularly in coal handling machinery. He referred to what are the best friction surfaces; all may be divided into the classes of leather, wood, cork and metal. He commented also on automobile clutches. Time being limited, discussions from Charles D. Rice, C. E. Billings, F. A. Waldron, Hiram Maxim and Forest R. Jones were read by title only; these will appear later in the *Proceedings* of the society. Thomas A. Fay, president of the Society of Automobile Engineers, declared that either disk or cone clutches if properly designed give entire satisfaction. He favored small diameters of clutches with leather eliminated and oil used.

At the close of the meeting resolutions of thanks were offered by C. W. Hunt to the Local Committee for all of the pleasures which the members of the society and their guests had been privileged to enjoy.

S. P. E. E. MEETING.

Simultaneously the Society for the Promotion of Engineering Education held its session, at which the following was the programme:

Report of the Committee on the Revision of the Constitution, by Prof. A. L. Williston.

Report of the Committee on Technical Books for Libraries, by Prof. A. H. Ford.

"Hydraulic Laboratories, Their Equipment, Method of Conducting Work, Their Efficiency as a Factor in Engineering Education, Methods of Teaching Hydraulics, &c., &c.," by Prof. D. W. Mead, University of Wisconsin.

"Electrical Laboratory Efficiency," by S. Sumner Edmands, Pratt Institute.

"Cement Laboratory Practice," by Prof. Ira O. Baker, University of Illinois.

"Entropy, a Simple Method of Presentation," by Prof. W. D. Ennis, Polytechnic Institute, Brooklyn.

"How Far is Pure Thermodynamics of Value in Preparing Students for Handling Mechanical Engineering or Heating Problems," by Prof. Arthur J. Wood, Pennsylvania State College.

FRIDAY AFTERNOON EXCURSION.

The concluding and very pleasurable feature of the American Society of Mechanical Engineers' meeting was the excursion Friday afternoon and evening by steamer to Bois Blanc Island at the outlet of the Detroit River into Lake Erie. Here a supper was served and the members and guests were returned by moonlight in time for many of them to make their train and boat connections for leaving the city.

ADDITIONAL S. P. E. E. PAPERS.

There yet remained for the Society for the Promotion of Engineering Education to hold two sessions, Saturday morning and Saturday afternoon, at which the following papers were presented:

Report of the Committee on Industrial Education, by Profs. C. M. Woodward and A. L. Williston.

"The Relation Between Engineering Education and Industrial Education," by Prof. Charles R. Richards.

"Two Years of the Co-operative Engineering Courses, University of Cincinnati," by Prof. Herman Schneider, University of Cincinnati.

"The Careers of Graduates in Mechanical Engineering," by Prof. De R. Furman, Stevens Institute of Technology.

"A Summer Course in Surveying," by Prof. Charles Derleth, Jr., University of California.

"The Co-ordination of Work in Drawing Rooms, Shops and Laboratories, and the Real Function of Shop Instruction for Engineering Students," by Prof. Dexter L. Kimball, Cornell University.

"The Concentric Method of Education in Engineering," by Prof. V. Karapetoff, Cornell University.

"Requisite Qualifications of an Engineering College Instruction," by Oliver B. Zimmerman, Charles City, Iowa.

"Should the Engineer Be Required to Hold License?" by Prof. Walter H. Drane, University of Mississippi.

"The Use, Abuse and Care of Lantern Slides," by Prof. Henry H. Norris, Cornell University.

"Shall We Try to Develop General Culture by Teaching Engineering Subjects in a Broad and Comprehensive Way? or Shall We Introduce Unrelated Subjects Because of Their Supposed Culture Value?" by Prof. E. Brydone, University of Manitoba.

"A Combined College and Engineering Course."

"A Five-year Course in Engineering. Is This Advisable?"

"How Shall We Teach the Lower Classes so That All Men May Come in Contact with the Older Professors—the Heads of Departments?"

Saturday evening at 8 o'clock this society held a banquet as the concluding feature of its meeting.

The Cramp Shipbuilding Company's Annual Report.

Notwithstanding the contraction in general business, the annual report of the William Cramp & Son's Ship & Engine Building Company for the 12 months ended April 30 shows net profits of \$555,735, an increase of \$227,467; fixed charges of \$313,008, a decrease of \$11,912; and a surplus of \$242,727, an increase of \$239,379. The last named item is equal to about 4 per cent. earned on the outstanding capital stock.

During the year the company redeemed \$160,000 of the 5 per cent. notes, and \$25,000 first mortgage 5 per cent. bonds, purchased \$48,000 mortgages held in trust, and expended \$77,995 in the purchase of real estate, tools, machinery, &c.

President Henry S. Grove states that, although the unsettlement of business following the late severe panic still continues, and as a consequence the volume of current business is less than in previous years, and the uncertainty of commercial conditions makes it difficult to form any judgment as to how long this condition of affairs will continue, much has been accomplished since the last annual report to strengthen the company's effectiveness and resources.

The general balance sheet, as of April 30, 1908, compares as follows:

Assets.		
	1908.	1907.
Real estate, machinery, &c.....	\$12,877,740	\$12,971,014
Bills and accounts receivable.....	748,123	1,577,200
Material and supplies.....	472,246	823,620
Cash	740,883	186,881
Claims in litigation, &c.....	713,484	1,068,368
Totals.....	\$15,552,486	\$16,627,184
Liabilities.		
Capital stock.....	\$6,098,000	\$6,098,000
Bonds and mortgages on real estate...	6,134,912	6,319,912
Wages, bills and accounts, bond interest, &c.....	333,773	963,521
Surplus	2,985,801	3,245,750
Totals.....	\$15,552,486	\$16,627,184

The Correct Way to Apply Detachable Link Belt.*

BY STAUNTON B. PECK.†

When considering the relative merits of different methods of running chain-drives, the drive should be considered as a whole, and the action noted at the four points indicated in Fig. 1—*a*, the entering point on the driver; *b*, the releasing point on the driver; *c*, the entering point on the driver sprocket; *d*, the releasing point on the driver sprocket. In this discussion, the action at a point is said to be good when all the articulation or bending takes place in the joint of the chain, Fig. 2. The action is said to be bad when, in bending, the link rubs on the sprocket, producing wear on the sprocket and outside or external wear on the hook, Fig. 3.

Another fact is also to be remembered—there is never

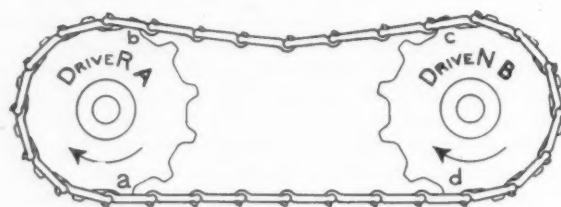


Fig. 1.—A Properly Applied Driving Chain.

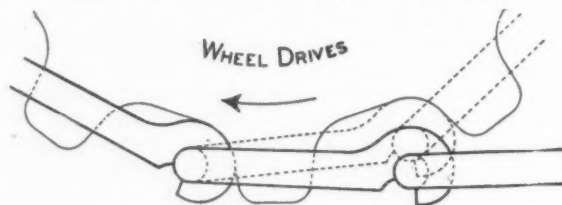


Fig. 2.—Good Action.—Bar Working In Hook.

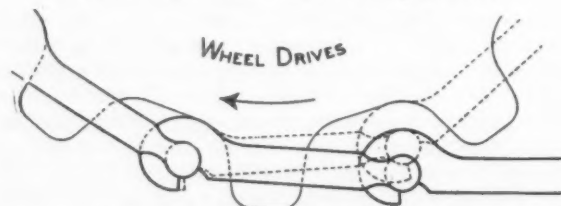


Fig. 3.—Bad Action.—Hook Working on Bar.

more than one tooth in action at any one time. No matter how carefully the chain and sprocket may be made, as soon as the load comes on, there is a change caused by stretch and wear. It can be predetermined which tooth shall be in action by making the pitch of the wheel either larger or smaller than the pitch of the chain. Thus, on the driver, Fig. 4, the wheel pitch being smaller than the chain pitch, the entering tooth does all the work. In Fig. 5 the conditions are reversed; the wheel pitch is the larger and the releasing tooth does the work. On the driven sprocket the same thing holds, except that here conditions are reversed. When the wheel pitch is smaller than the chain pitch the releasing tooth does the work, Fig. 6. When the wheel pitch is larger than the chain pitch the entering tooth does all the work, Fig. 7. For the best work the pitch of the driver should be larger than the pitch of the chain, see Fig. 5, and the pitch of the driven sprocket should be smaller than that of the chain, as in Fig. 6. The releasing teeth *b* and *d* are then the working teeth and the chain can set at *a* and *c* quietly and take the load gradually as the wheel revolves.

Next to be considered is the drive as a whole to determine whether the chain links shall be run bar first or hook first.

In Fig. 8 the pitch of the driver is larger and that of the driven sprocket smaller than the pitch of the chain, hence *b* and *d* are the teeth in action. The chain runs with the bar of each link leading; the action at *a*

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† Vice-president of the Link-Belt Company.

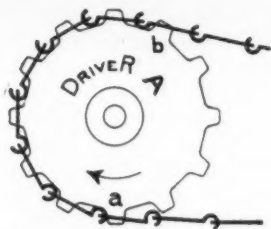


Fig. 4.—Wheel Pitch Smaller than Chain Pitch.

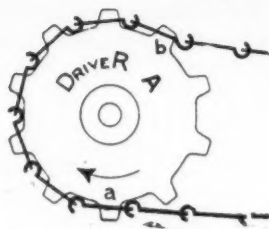


Fig. 5.—Wheel Pitch Larger than Chain Pitch.

Driving Wheel.

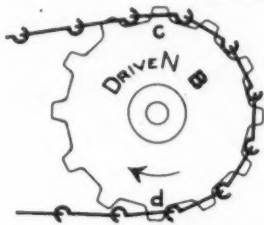


Fig. 6.—Wheel Pitch Smaller than Chain Pitch.

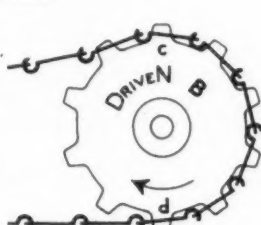


Fig. 7.—Wheel Pitch Larger than Chain Pitch.

Driven Wheel.

is good, at *b* bad, at *c* good and at *d* bad. In Fig. 9 the sprockets are the same as in Fig. 8, but the chain links run hook first. Here the action at *a* is bad, but the fact that the hook is not in contact with a tooth face at this point makes the consequent wear of little extent. The action at *b* is good. The action at *c* is bad, but this is on the slack side of the chain and this bad action causes no wear. The action at *d* is good. It is thus seen that there are two very bad points, *b* and *d*, where the links run bar first, and only one serious trouble, *a*, when running hook first.

As usually furnished the sprockets are ground to fit the new chain; when the latter stretches both the driver and the driven sprocket are smaller in pitch than the chain and teeth *a* and *d* are now in action. In Fig. 10 is shown a pair of wheels with the chain links running bar first. The action at *a* is good; at *b* it is bad, but as there is no tension on the chain at this point this is not objectionable. At *c* the action is good; at *d* it is bad. In this case, therefore, it would seem that the wear would be confined to the driven wheel. This is so in actual practice.

The same wheels with the links running hook first are shown in Fig. 11. The action at *a* is bad, at *b* it is good, at *c* it is bad, but not objectionable, because, as before, there is no tension at this point, and the action at *d* is good. Thus all the wear would seem to be on the driver as a result of the action at *a*. This is found to be the case, and theory and practice agree that with the chain links running bar first the driven wheel wears, and with the chain links running hook first the driver wears.

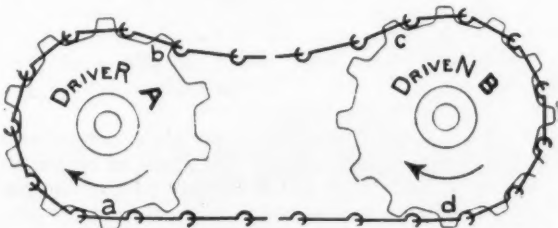


Fig. 8.—Pitch of Driver Larger and Driven Wheel Smaller than Chain Pitch, with the Links Running Bar First.

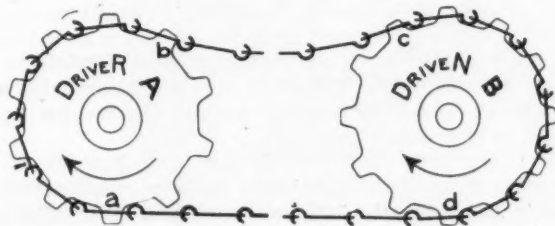


Fig. 9.—Pitch of Driver Larger and Driven Wheel Smaller than Chain Pitch, with the Links Running Hook First.

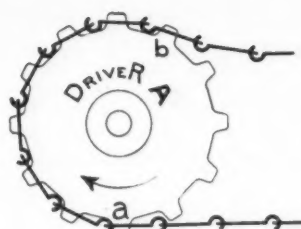


Fig. 10.—Pitch of Both Wheels Smaller than Chain Pitch, with the Links Running Bar First.

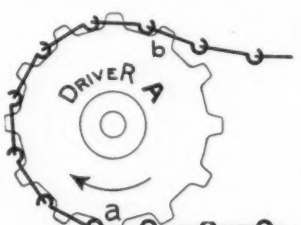


Fig. 11.—Pitch of Both Wheels Smaller than Chain Pitch, with Links Running Hook First.

It is found that because the wear at *d*, running bar first, is caused by the link slipping up the tooth, it tends to undercut and form a hook and thus break the chain. On the other hand, the wear at *a*, when running hook first, is caused by the link slipping down the tooth, and the wheel will wear out completely without endangering the chain. It has also been proved that the driver, when running the chain links hook first, lasts several times as long as the driven wheel when running the links bar first. As the driven wheel is in nearly every case much larger than the driver and the consequent wear on each tooth is less, it would seem that if the chain were run so as to wear the driven wheel the wear on the two wheels would be equalized. This would be poor practice, for the reason that the driver, being smaller, is more cheaply replaced and the repair account will therefore be less running the links hook first.

In elevators, Fig. 12, the head wheels acts as a driver, the foot wheel simply as an idler, because it is doing no work. Therefore the chain links should be run bar first, so as to favor the driver. On conveyors one wheel is always an idler, comparatively speaking, and the same reasoning holds as for elevators; the chain links should run bar first in all cases.

The foregoing applies equally well to all closed end

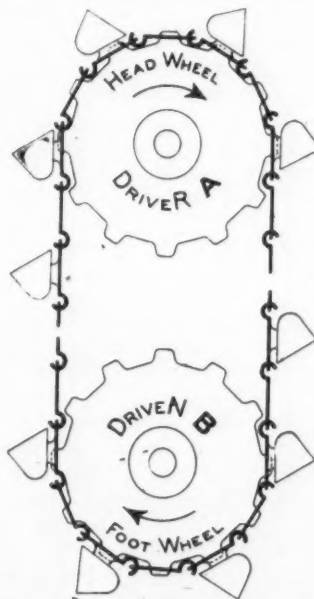


Fig. 12.—An Elevator Chain, with the Links Running Bar First.

pin chains; the closed end corresponds to the hook and the pin end to the bar of the Ewart chain. In general, therefore, on drives run hook first, on elevators and conveyors run bar first.

The United States Cast Iron Pipe & Foundry Company.

The United States Cast Iron Pipe & Foundry Company reports its profit and loss account for the fiscal year ending May 31, 1908, as follows:

Gross income from operations.....	\$637,617.83
Other income for the year.....	136,656.62
Total income.....	\$774,274.45
Less interest on American Pipe & Foundry Company's bonds.....	90,000.00
Net earnings.....	\$684,274.45
Reserved to secure doubtful accounts.....	12,000.00
Remainder.....	\$672,274.45
Add surplus May 31, 1907.....	631,801.12
Total.....	\$1,304,075.57
7 per cent. dividend paid on preferred stock.....	\$875,000
2 per cent. paid on common stock.....	250,000
	1,125,000.00
Surplus May 31, 1908.....	\$179,075.57
Distribution of surplus:	
For improvements in lieu of depreciation.....	163,051.12
Balance, profit and loss, May 31, 1908.....	\$16,024.45
BALANCE SHEET AS OF MAY 31, 1908.	
<i>Assets.</i>	
Cost of properties.....	\$24,095,935.45
Treasury stock at cost.....	347,555.00
Bonds of American Pipe & Foundry Company and sinking fund.....	589,103.67
Raw and manufactured material, &c.....	2,147,074.00
Accounts, bills receivable, &c.....	2,081,041.78
Cash.....	739,289.55
Total.....	\$29,999,999.45
<i>Capital and Liabilities.</i>	
Preferred stock issued.....	\$12,500,000.00
Common stock issued.....	12,500,000.00
Bonds of American Pipe & Foundry Company....	1,500,000.00
Accounts payable.....	903,199.38
Total capital and liabilities.....	\$27,403,199.38
Reserve for working capital.....	\$2,459,896.64
Reserve for insurance fund.....	100,000.00
Reserve to secure doubtful accounts.....	20,878.98
	2,580,775.62
Profit and loss.....	16,024.45
Total.....	\$29,999,999.45

President George B. Hayes makes the following report to the stockholders:

"The report which your directors are making you to-day is, superficially considered, not very encouraging, but I am glad to be able to say to you that your directors do not feel at all discouraged about either the condition or the business of the company. The month of October, 1907, was one of the most prosperous months which the company has ever had. During the month of November, 1907, business absolutely stopped. The company did not lose its business. There was no business. The winter months in the cast iron pipe business are always dull months. When there was added to this natural condition the depression which was caused by the panic, the result was a stagnation such as has never been known in the history of the cast iron pipe business in this country. Not only was there a cessation of business, and a sharp fall in prices in November, but there was a declining market all through the winter and early spring months.

"I am glad to say to you, however, that, with the opening of spring, business has improved. The inventories presented to-day are made at the market. The company has no outstanding bills payable, and no debts of any kind, except for the current raw material. Not only this, but the company went through the panic without borrowing a dollar, or discounting or selling its bills receivable. On the other hand, it paid in cash for all of its supplies and raw material. The company has plenty of money, and its plants are in first-class condition.

"So far as dividend possibilities are concerned, as you know, since the organization of the company, there has been created an account known as 'reserve for additional working capital.' To this account, in addition to the large sums spent out of the net earnings for extensions and new construction, amounting to \$1,802,450.13, there has also been credited out of net earnings the sum

of \$2,459,896.64. This account is distinct from, and is a surplus over and above, the original working capital of the company. There is no financial reason why a portion of this reserve or surplus should not be used for the payment of dividends until the present period of depression shall have vanished. This, of course, is contingent upon this period of depression not lasting too long, but as I have said, it is already beginning to pass away. Owing, however, to the phraseology of the charter, there seems to be some legal doubt as to whether or not any part of this surplus may be used for dividend purposes. After carefully considering the matter, your directors are of the opinion that it would be for the best interests of the company to have the question determined by judicial decision, and a suit for the determination of this question will probably be instituted at once. If a favorable decree is entered, the preferred stockholders may expect to receive the usual quarterly dividend on the preferred stock."

Results of Fuel Investigations.

In an address before the annual convention of Smoke Inspectors, at Cleveland, Ohio, June 24, D. T. Randall, engineer in charge of tests of the United States Geological Survey's fuel testing plant, summed up the results of the investigations as follows:

A study of the fuel values of coals burned while conducting some 540 boiler tests has shown that the value of the coal depends almost entirely on the number of heat units which it contains as determined by a calorimeter, these relative values being influenced somewhat by the amount and character of volatile matter and of ash present in the coal. This information has strengthened the position of the Government engineers who desire to purchase coal on a specification which has for its basis of payment the British thermal units and ash in the coal.

For the coming year a very large part of the coal purchased for the Government will be paid for according to its value as determined in the Government chemical laboratories. One of the largest purchases under this form of contract is for use on the Isthmus of Panama, and calls for the delivery of 400,000 tons within the year.

Investigations of the washing and coking tests of coals have also shown the possibilities of utilizing poorer grades of coal than are commonly used, and point to a very considerable saving in our fuel supply. The experiments on the briquetting of coal have shown that the slack coal which is otherwise difficult to utilize, may be made into artificial lumps and used with high efficiency in power plants or for locomotive use.

A study of the furnace conditions in connection with the boiler tests will show the influence of different methods of burning coal with relation to the reduction of smoke. These tests have demonstrated the possibility of burning certain kinds of coal efficiently without smoke in an ordinary furnace. They have pointed to possibilities of modifying furnaces so that practically all fuels may be burned without smoke under favorable conditions. Some bulletins have already been issued on this work, but those which deal directly with the smoke problem are now in course of preparation.

The tests made at the producer gas plant have shown that it is possible to burn almost any grade of coal with the very highest efficiency and absolutely without smoke. Bituminous coals having as high as 45 per cent. of ash, lignites and peats, which are considered low grades of fuel for boiler furnaces, have been very successfully burned in the producer, generating gas for the development of power in a gas engine. The low-grade lignites of North Dakota developed as much power per pound in the gas producer as do the very best West Virginia bituminous coals, when utilized in a steam boiler with a simple non-condensing engine, such as is usually installed in manufacturing plants.

The results of these investigations will have an important bearing on the question of smoke prevention, both directly and indirectly, but the Government is investigating the possibilities only from the engineering and not at all from the legal standpoint.

The Kempsmith Circular Milling Attachment.

Two unusual milling machine operations, made possible on the standard milling machine through an improved circular milling attachment just produced by the Kempsmith Mfg. Company, Milwaukee, Wis., are illustrated herewith. Either of these jobs is such as might be encountered in any general repair or jobbing shop.

Fig. 1 shows the attachment used in milling the faces of 12 in. pulleys. The rough pulley is mounted firmly on the attachment, and through the power feed, is revolved against the inserted tooth milling cutter screwed on the spindle. The table is adjusted slightly off-center longitudinally, which results in a convex cut, thus producing the crown on the pulley face. It is not claimed that on this job the milling machine is the equal of a special or automatic machine designed for this purpose; the main advantage is that, in addition to the wide range of work possible on the standard miller, the use of this attachment accomplishes satisfactorily and almost automatically, this character of work which would otherwise require a more specialized and more expensive equipment. The extent of the cut and the consequent strain involved give an idea of the rigidity of the attachment.

Fig. 2 shows the attachment employed in cutting a gear, 6 pitch, 18 in. diameter, which is far too large to swing on the dividing head. It is mounted horizontally on the attachment, and the power vertical feed of the miller is used in cutting the teeth. The worm shaft of the attachment is arranged to readily receive the index plate mechanism, as regularly furnished with dividing heads, and since the ratio of worm and worm wheel is the same as on the dividing head, the full range of divisions is obtainable. The large diameter of the worm wheel insures accuracy. This makes the circular attachment in effect a dividing head, especially valuable in cutting large diameter gears, which could not be handled easily in any other manner except on a special machine.

The attachment is built in two sizes, with 14 and 18 in. tables, respectively. The table has a solid bearing for almost its whole extent on the attachment base, and is clamped at any angle through the same patent ring clamping mechanism that is used on the Kempsmith universal millers. The table can be released from the worm wheel for quick revolving.

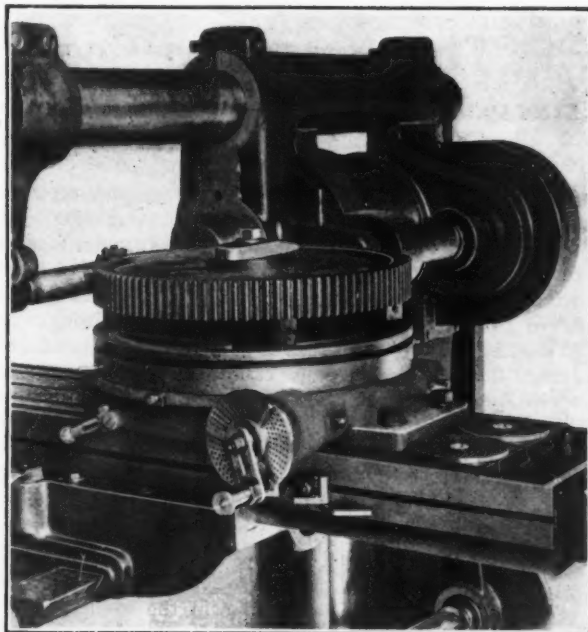


Fig. 2.—The Kempsmith Circular Milling Attachment Applied to the Cutting of Large Gears.

Fire Protection Engineering.—The Boston Manufacturers' Mutual Fire Insurance Company, 31 Milk street, Boston, Mass., has issued a new edition of its Insurance Engineering Experiment Station's Report No. V on "Slow Burning or Mill Construction." This report has been revised and enlarged. It contains a great deal of matter which will be found of service to those connected with industrial undertakings, giving practical instructions, accompanied by illustrations so that proper systems of fire protection can be installed. Diagrams are freely used, showing ideal mill plants and methods of securing fire preventive measures. The price of this book is only 25 cents per copy. This is very much less than the cost of publication, but the intention is to limit requests for the work simply to those who can make use of it to good advantage, and will therefore value it.

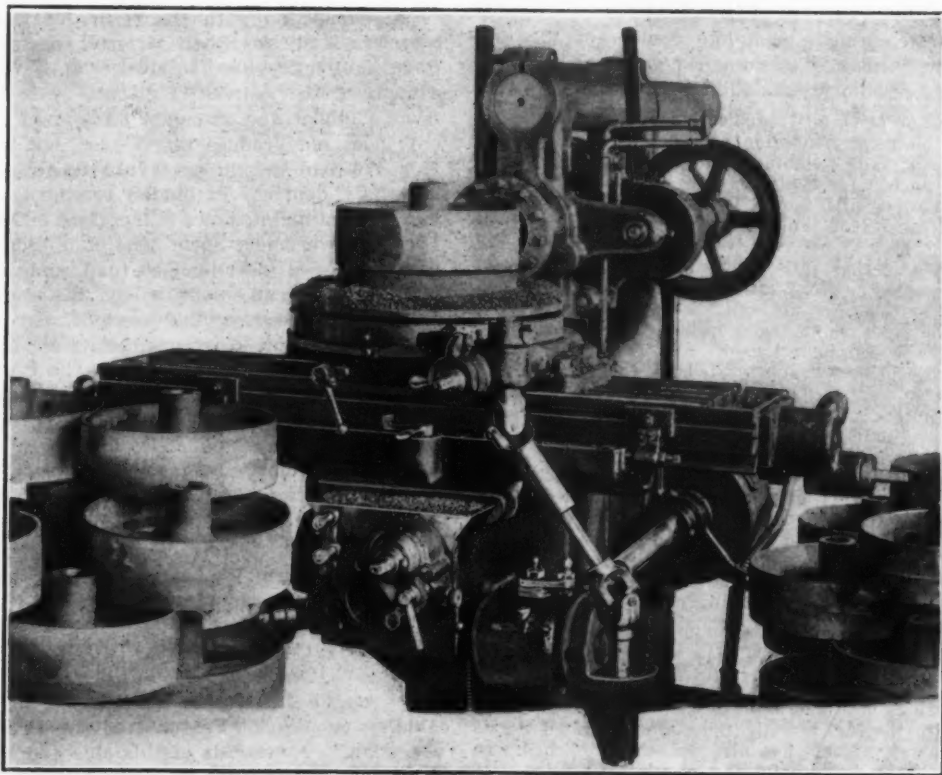


Fig. 1.—The New Circular Milling Attachment Made by the Kempsmith Mfg. Company, Milwaukee, Wis., as Used for Finishing Crowned Pulley Faces.

The American Society for Testing Materials.

Steel Rails, Pipe Corrosion, Preservative Coatings and Other Important Questions Discussed at the Eleventh Annual Meeting.

From the standpoint of iron and steel manufacturers and metallurgical engineers, rails and corrosion were again the chief topics of discussion at the annual meeting of the American Society for Testing Materials, held at Atlantic City, June 23 to 27. While some well remembered ground was traversed again, much was brought out indicating that real progress is being made in the clearer recognition of the causes of rail failures and in the co-operation of manufacturer and user in applying remedies. The masterly paper of the president, Dr. Charles B. Dudley, of which a synopsis was given to our readers last week, received marked approval for combining incisiveness and fairness.

Dry Blast in Bessemer Steel Making at South Chicago.

An interesting sequel to President Dudley's remarks on what he considered the lack of progress in Bessemer practice in the last 20 years came at the opening of the Friday morning session. Referring to what he had said on this subject in his opening address of Tuesday evening, Dr. Dudley said he believed the agitation of the past two years had resulted in stimulating inquiry and experiment, and he took pleasure in presenting the results of some recent experiments, as given in the following letter he had received since the beginning of the meeting. It was written by P. H. Dudley, at the South Works of the Illinois Steel Company, South Chicago, Ill., and bore date of June 24:

It may be of interest for you to announce to the society that for the past month here at the South Works of the Illinois Steel Company the dry blast has been applied in the Bessemer practice with excellent results. The steel sets solid, with scarcely a trace of blow holes upon the sides except near the extreme top or cap of the ingot. The few blow holes found in the interior of the ingot were without oxidized surfaces, quite in contrast to the ordinary ingots. The metal is exceedingly tough under the drop test. The moisture the past few humid days, of 8 to 9 grains per cubic foot of air, was reduced to less than 2 grains per cubic foot entering the Bessemer converter. This marks a decided step in the reduction of the variable of moisture entering the Bessemer converter to blow the bath of molten metal.

Some Features of the Meeting.

Without attempting a complete resume of the proceedings, mention may be made at the outset of a few of the matters acted on or discussed at the meeting:

The Bessemer steel rail specifications adopted last year were altered on recommendation of Committee A in three particulars. For rails weighing 85 to and including 100 lb. per yard a drop test for every blow of steel is provided, instead of from every fifth blow. Instead of an allowable 10 per cent. of seconds it is provided that "No. 2 rails shall be accepted to at least 5 per cent. of the whole order." An added provision is that rails rejected under the drop test will not be accepted as No. 2 rails.

The contributions to the rail discussion showed that much valuable experimental work is being done to discover and remedy the defects in rail steel.

Some new evidence was presented on the relative corrodibility of iron and steel pipe, but the data were not sufficient to warrant definite conclusions, though as far as they go they seem to indicate improvement in pipe steel through the methods of working adopted in the past two or three years. The investigation of the corrosion of iron and steel, in the light of the theory of electrolysis as presented at the previous meeting by A. S. Cushman and W. H. Walker, is progressing. The Committee on Corrosion of Iron and Steel will have the co-operation of the American Steel & Wire Company in an inquiry about to be made into the corrosion of wires of varying carbons and manganese.

The report of the society's Committee on Preservative Coatings indicated good progress with the elaborate paint tests now being conducted, and from which valuable results are expected.

As at previous meetings, reports were made of the progress made with the fuel investigations of the United States Geological Survey. Much has already been published. In reference to the investigation into the relative efficiency of gasoline and denatured alcohol, Chief Engineer H. M. Wilson reported that compression up to 180 lb. and the method of manipulation had given results not previously attained. Denatured alcohol in this way was brought to the same

power producing value, gallon for gallon, as that of gasoline, though its heat value is only six-tenths as much.

The Committee on Standard Specifications for Pig Iron presented as a substitute for grading by fracture and the use of grade numbers, the purchase of pig iron by analysis, and a code scheme of symbols was submitted, representing the various percentages of the metalloids. This was given in *The Iron Age* of January 30, 1908, p. 365.

Other interesting features of the meeting were the partial report on the investigation of steel at Watertown Arsenal and the recommendation of the society's Committee on Uniform Boiler Specifications that the phosphorus and sulphur limits for boiler steel be lowered.

THE OPENING SESSION.

The annual report of the Executive Committee presented at the opening session Tuesday afternoon showed a membership of 1015. The additions in the year were 150, with a net gain of 90. Apparently, the society is at high point in influence and membership.

W. A. Aiken, Philadelphia, read the first paper, entitled "Testing is not Inspection." He said that the fundamental intention of inspection is to secure materials and workmanship in accordance with specifications, and this cannot be accomplished by testing alone. The selection of test bars in the way decided by the manufacturer and the acceptance of the chemical analyses of the manufacturer by the consumer were cited as examples of the loose practice that has grown up.

The report of Committee B on Standard Specifications for Cast Iron and Finished Castings, Walter Wood, chairman, was read by Secretary Marburg. It said that the standard specifications for cast iron pipe adopted by this society has been adopted practically without change by the American Water Works Association. The committee has formulated a new specification for foundry pig iron, but does not desire action on it as yet. The report also brought up a resolution passed by the American Foundrymen's Association at Toronto this month deprecating the further use of pig iron grade numbers in any form and favoring analysis as the sole basis of purchase. The committee was authorized to co-operate in this movement for the abolition of grade numbers.

In connection with the report of Committee H on Standard Tests for Road Material, the chairman, L. W. Page, said that while the steel tires of vehicles wear off enough of the coarser fragments of road materials to make a binder, the automobile has upset all this. It not only does not produce this binder, but it gathers it up from the road and throws it into the air. The underlying materials, deprived of binder, become loosened, and the cost of road maintenance is increased 100 per cent. The French Government spent tens of millions of dollars on 24,000 miles of macadamized road, and now the automobile has to such an extent undone this work that the problem has become exceedingly serious.

H. M. Wilson, chief engineer, gave a resume of the work of the technologic branch of the United States Geological Survey in the past year, particularly in its fuel investigations. J. E. Woodwell presented a paper on a kindred subject, "Commercial Results in the Purchase of Coal on Specifications," showing how this basis of purchases is coming more and more into use.

The result of the ballot for officers was announced, all the following being re-elected: Charles B. Dudley, president; Robert W. Lesley, vice-president; Edgar Marburg, secretary-treasurer; James Christie, member of Executive Committee.

THE CORROSION OF IRON AND STEEL.

The first part of the Tuesday evening session was given up to the presidential address of Dr. Charles B. Dudley on "Some Features of the Present Steel Rail Question." A synopsis of this able address was given in *The Iron Age* of June 25. The latter half of the evening session was devoted to papers and discussions on the corrosion of iron and steel. An abstract of a paper by Profs. H. M. Howe and Bradley Stoughton on the "Rela-

tive Corrosion of Steel and Wrought Iron Water Pipes" was read by Mr. Stoughton. It dealt chiefly with investigations carried on by the writers on behalf of the National Tube Company, bearing on these questions:

1. How does the modern steel pipe of the National Tube Company compare as regards pitting and as regards loss of weight by corrosion with the present wrought iron pipe?
2. How does it compare with that company's steel pipe of 1897?
3. How trustworthy is the basis of the popular distrust of steel pipe?

Tests of Iron and Steel Pipe.

It was stated that the tests thus far made are not conclusive, and that further tests will be made and comment on them added to the paper before it is printed in the Proceedings of the society. Some of the statements as to the method of making the tests and the conclusions derived from them are given below:

First, 12 pieces of modern steel skelp of 1906 and 10 of wrought iron of 1906 were immersed side by side, insulated from each other in wooden crates, for 224 days in hot aerated sea water, a condition which in previous tests has usually appeared the most unfavorable to steel. Then the same pieces of modern skelp were re-exposed in like manner for six months along with 12 pieces of steel skelp of 1897. Thus the time of exposure was as follows:

Wrought iron of 1906.....224 days
Modern steel skelp of 1906..... 13 months
Steel skelp of 1897..... 6 months

It was found that, whereas the loss of weight in seven months of modern steel skelp and wrought iron skelp was practically identical, yet the wrought iron skelp, though from the best makers, pitted in seven months much deeper than the steel did in 13 months. It seems to us that the fairest way is to confine our attention to the deepest pit in each plate, because, as has well been said before this society, if there is a hole the water will run out, no matter how much the pipe weighs. Using thus the deepest pit in each piece as a basis of comparison, in our tests the steel pitted very much less than the wrought iron. Thus 9 out of the 12 steel pieces pitted very much less deeply than any of the wrought iron pieces. The remaining three pieces of steel pitted only very slightly deeper than the very best of the wrought iron pieces.

The 1897 steel lost in six months about 9 per cent. more by weight than the modern steel of 1906 lost in six months, and pitted in six months very much deeper than the modern pieces pitted (in their total exposure of 13 months) less than 0.005 in.; only two of the 1897 pieces (in their six months exposure) pitted as little as this, and half of them pitted from 4 to 12 times as deep. The deepest pit in any of the modern steel pieces was 0.014 in. Only four out of the 12 pieces of 1897 pitted as little as this, and of the remaining eight, four pitted at least half deeper than this, and one pitted more than four times as deep.

In the sulphuric acid bearing water of coal mines modern steel pipes have been found to pit less than wrought iron ones exposed alongside, apparently under conditions which should insure a perfectly fair test. These are reported in *The Iron Age* of July 12, 1906. We learn of other cases in which like results have been reached. As to these we hope to write more positively in revising this paper for its final form.

We learn that 29 pipes, all believed to be wrought iron, after long use in the interlocking and signal systems of a very important railroad, were lately examined, with the results that 12 were found to be steel and only 17 iron. The life of the steel pipes was in this case somewhat longer than that of the iron ones. Thus, of those which were practically destroyed by corrosion and pitting,

11 were of steel, with an average life of.....13.5 years
8 were of iron, with an average life of.....10.4 years

We believe that the reports as to the relative pitting of steel and iron pipes are based in large part on the testimony of plumbers and pipe fitters. In order to throw some light on the competence of these witnesses to testify on this question, and on the value of their most positive assertions, we bought from 19 different plumbers' shops 19 different pieces of pipe, which we were assured were wrought iron. On examining them we found that 13 out of the 19 were steel. To test the matter further, one of us submitted several pieces of pipe which he knew by his own etching tests to be steel, and others which he knew to be wrought iron, to four different plumbers, and asked them to tell, by cutting with a die or otherwise, which were steel and which iron. One plumber, after making several attempts, admitted that he could not tell. The three others reached the results given in the following table. In every case the plumber made the tests with his own dies:

Plumber No.	No. of pipes tested.		No. reported right.		No. reported wrong.		Percentage of error.	
	Iron.	Steel.	Iron.	Steel.	Iron.	Steel.	Iron.	Steel.
1.....	11	11	6	10	5	1	45	9
2.....	6	6	0	6	6	0	100	0
3.....	6	6	0	6	6	0	100	0

This goes to show that cutting with a die, the only ready test the plumber has, is not trustworthy. . . . It would seem to us to be an act of wisdom, where pipe is purchased in large enough quantities to warrant the expense, to subject it to specifications and inspection, just as in the case of steel rails, or steel or cast iron car wheels, or tires, or steel castings.

The Case of Wrought Iron Pipe.

George Schuhmann, Reading Iron Company, Reading, Pa., presented the case of wrought iron pipe, and argued for its greater resistance to corrosion than that of steel. The familiar reason of the interlacing streaks of slag between the fibers of pure iron, in the case of puddled iron, was given. It was explained that iron made from scrap by the busheling process, which also covers the iron with slag, does not resist corrosion as well as puddled iron, 1. because there is very much less slag in scrap, and the pieces of steel intermixed are not brought to the fusion point, so that the slag can penetrate them; 2. owing to the variations in junk yard scrap from high carbon steel to hoops and cans, there are greater differences in electrical potential than in puddled iron, so that electrolysis is accelerated. Mr. Schuhmann referred to the results with wrought and steel conduit pipes for the Rochester, N. Y., water supply. The wrought iron pipe laid in 1873-75 required no repairs for 19 years; then from 1894 to 1904 less than 10 leaks from corrosion were reported, and none since 1904. The steel conduit laid in 1890 developed rust holes in 1900, and up to 1907 the total repaired was 164. The iron pipe was 3-16 to 1/4 in. thick, and the steel pipe 1/4 to 3/8 in. thick. Laboratory tests the speaker regarded as far from conclusive in comparison with service tests, citing as an example of the former the tests with about 5 ft. each of 2-in. iron and steel pipe, exposed to hot water service for a year, calculations then being made by taking micrometer measurements of the depth of corrosions.

Professor Stoughton remarked that the Rochester water conduit data do not bear on the question since the Rochester pipe were all coated. They could not be a basis for deductions, therefore, as to the durability of steel for boilers or other uses of uncoated steel.

The Improvement of Steel Pipe.

F. N. Speller, National Tube Company, Pittsburgh, said that the argument for the protecting effect of cinder in wrought iron would be reasonable if the grains of iron are enveloped in cinder or if the cinder lies in sheets, between which are sandwiched layers of iron. He added:

Aside from the fact that we have only 1 1/2 parts of cinder to protect 98 parts of iron, any one who has looked at a polished section of wrought iron pipe under the microscope understands that the cinder is very irregularly distributed in strings and patches, and that there are many loopholes through which corrosion is unobstructed, entirely free from cinder. Moreover, owing to the concentration of cinder in places, electrolytic action comes into play, accelerating corrosion at the weak points. Hence, instead of being a benefit, cinder in puddled iron seems to be the chief cause of irregular corrosion.

We recognize our share of responsibility in that steel, in order to have the highest resistance to corrosion, must be uniform and well worked. Our experience along this line started back in 1903. Tests made prior to this date in the laboratory indicated that pitting was usually caused by electro-negative substances adhering to the surface of the metal, such as mill scale, which was shown to have as much as two-tenths volt difference of potential from the iron. On removing this scale corrosion became considerably more uniform. It was found that steel which had been locally worked or forged gave better results than when simply rolled out. This led to the development of a process of mechanically working steel which has come into general use in our mills. There is no mysterious principle involved in this treatment, and we believe the beneficial effect of such local work at proper temperature will be admitted by all. There is not time, nor is this perhaps the place, to discuss mechanical details of the process employed. I would like to say, however, that improvements in the metallurgy of pipe steel during recent years have contributed largely to rendering the metal more serviceable.

Regarding the protection of iron from rusting, Dr. Cushman has indicated possible methods by which this may be accomplished by preventing the solution of iron. The practical application of this remains to be worked out. In the meantime, however, we can in many cases prevent the secondary reaction, viz., oxidation, without which corrosion is hardly noticeable. In the case of boiler waters or heaters, this may be accomplished in part by preheating the water,

thus driving off the gases, or by passing the heated water over a large surface of steel turnings or other scrap, through which agency the oxygen is removed by well-known reactions. We have applied this method with encouraging results in an experimental way.

The Electrolytic Theory of Corrosion.

For Committee U, on the Corrosion of Iron and Steel, the chairman, Dr. Allerton S. Cushman, Washington, D. C., reported that considerable progress had been made in the studies of the past year. A brief synopsis follows:

The evidence brought forward by various investigators seems conclusive as to the fact that corrosion is an electrochemical phenomenon. Much experiment is still necessary to determine whether the methods of preventing corrosion suggested by these researches will prove of practical value. Co-operative tests have been arranged between the committee and the American Steel & Wire Company, in charge of a sub-committee, consisting of A. S. Cushman, W. H. Walker and S. M. Rodgers. The particular matters to be investigated are the effect of possible segregation in the ingot, the influence on wire of high carbon and manganese versus low carbon and manganese, and in the third place, the effect of increasing amounts of manganese on basic open hearth steel. Independently of these tests opportunity will be given manufacturers who control special methods for protecting steel to expose at the same time panels of wire fencing under the auspices of the committee.

Tests are under way to demonstrate the ability of certain pigments to prevent corrosion. A number of steel columns under the Steel Pier at Atlantic City have been painted under the auspices of the Paint Manufacturers Association of the United States, with rust inhibiting compounds, based on zinc chromate formulæ supplied by Chairman Cushman.

As a quick preliminary test of the resistance of steel and iron to corrosion the standard acid bath has been used by the committee. It cannot be said that the results of the acid test are an indication of the rust-resisting power of metals, and certainly, according to the committee, they are not a basis for inferring that metal manufactured by one process is superior to that manufactured by another. The committee has experimented with the immersion of pieces of sheet metal made from Bessemer steel, puddled iron and charcoal iron in water and a salt solution. Only slight differences were noted in the losses in weight, and the committee does not consider that the immersion test is of value in determining resistance to corrosion unless the immersion bath is constantly aerated.

Dr. Cushman followed the report with a paper on "Electrolysis and Corrosion," which in part repeated the line of argument presented in his paper read at the meeting of 1907. A new set of specimens was shown, exemplifying by the use of wire nails the electro-chemical action which the speaker identified with rust formation. The paper gave the modern physico-chemical explanation of electrolytic solution tension. He held that since under ordinary conditions of service metals suffer corrosion only by first passing into solution, corrosion can only be prevented or inhibited either by aiding the resistance of the entrance of more ions into solution, or by covering the surface of the metal with a waterproof coating, or by doing both. Two lines of progress may be followed in combatting corrosion, there being both a metallurgical problem and a paint problem. The application to metals of a first or prime coat containing a substance inhibiting electrolysis—zinc chromate, for example—it was thought would give good results. The paper urged the importance of studying the effects of the usual metallic impurities which accompany nearly all forms of merchantable iron and steel, referring, as illustration, to the now general belief of metallurgists that the use of manganese has been overdone. He had recently found that impure metallic manganese, when in a finely divided condition, is soluble in water, decomposing it with a rapid evolution of hydrogen. Since this is the case, it is not surprising, if even slight segregation has taken place in manganiferous steel, that the polarization effects would be modified and increased.

IRON AND STEEL INVESTIGATIONS.

The first paper at the Wednesday morning session was that of Dr. William Campbell, Columbia University, on "Some Practical Applications of Metallography." The writer detailed the results of microscopic studies of the structure of steel, particularly noting the effects of varying heat treatment. One important development of the experiments contradicted the old idea that the higher the temperature at which the rolling of steel is stopped,

above the critical point, the coarser the grain. While it had been taught that 800 degrees Cent. is the critical temperature for rail steel, some mills are working such steel at 1050 to 1100 degrees Cent., and producing rails of fine grain. It is found that the nearer the final rolling is to the critical temperature the better the ductility. Reference was also made to microscopic examinations of wrought iron and low carbon steel. It was found, the speaker said, as easy to distinguish good and bad wrought iron under the microscope as to distinguish chalk from cheese.

In the discussion of the paper it was stated that steel rolled at about 1000 degrees gives the greatest tensile strength; also that the condemnation of material on the ground of coarse grain had been proved completely in error. The discussion drifted into a consideration of the causes of shelling out of steel. A case was cited of two tires on the same axle in which one developed this trouble while the other did not, while both were from the same ingot. It was stated that the theory of slag and oxide had been abandoned. Another speaker referred to the same trouble, with cast iron wheels, the view being taken that it was due to peening.

Secretary Marburg gave an outline of the programme proposed for the investigation of structural steel at the Watertown Arsenal, and J. E. Howard followed, with some data obtained in the tests already made of lap welded tubing and rolled H sections, these being a part of the investigation of steel columns.

Tests of Steel Springs.

J. A. Kinkead, chairman of Committee T, on Tempering and Testing of Steel Springs and Standard Specifications for Spring Steel, reported that several railroads have worked to one or the other of the specifications proposed last year, but have not reported results. Tests were conducted at the Baldwin Locomotive Works to determine the effect of different methods of tempering on the elastic limit and modulus. It was clearly shown that the modulus bears no close relation to the elastic limit. The question has come up as to the most satisfactory fibre stress in springs. To determine whether a low or high elastic limit is desirable, tests will be carried out in the coming year. Investigation is also being made of the effect of banding. One road has found an average of five failures of short plates to one of main plates. Dr. Dudley observed in connection with this report that the question how to avoid the breaking of semi-elliptic springs of locomotives has become a very important one.

THE STEEL RAIL SESSION.

So much has happened in connection with steel rails since the Steel Pier discussion at the society's meeting last year that the proceedings this year naturally were not attended with the same degree of expectancy. The session of Wednesday afternoon was opened with the reading of the report of Committee A on Standard Specifications for Iron and Steel, W. R. Webster, chairman. It gave the results of the committee's conferences on rails in the past year, with the few changes recommended in the specifications adopted since the last meeting. On the question of discard the report says that in view of the recently developed disposition to leave the discard to the manufacturer, the consumers protecting themselves by such testing as will secure only good rails, the committee believes the present provision in the society's specification, making the discard a matter of agreement, should remain unchanged. On the matter of drop test the report says:

The satisfactory height of drop is affected by the rail section used, and very greatly by the drop-testing machine employed. The whole subject of rail sections and drop-testing machines is at the present moment in a very chaotic condition and much experimental work is now being done. Furthermore, the relation between the strain in the rail produced by the drop test and the strains produced in service has not yet been ascertained with any degree of certainty. The information thus far obtained indicates: 1, that many of the drop-testing machines used in the past have given very fallacious results, owing to inferior foundations and anvils; 2, that due to this defect in the drop-testing machines heretofore employed, but little reliable information in regard to the best and proper heights of drop can be obtained from past practice. Rapid progress is being made in the design and

manufacture of drop-testing machines, and already a proposed standard design has been prepared, and it is hoped it will be in shape to be presented at the next meeting of the society. In view of these uncertainties, and until more positive data can be obtained by experiment, your sub-committee does not see its way clear to recommend any change at the present time in the standard heights of drop of the rail specifications.

The Watertown Arsenal Investigation of Steel.

"Some Results of Tests of Steel Rails in Progress at the Watertown Arsenal" was the title of a paper, accompanied by numerous photographs of failed rails and microphotographs of specimens illustrating the structure of the steel. It was read by the author, J. E. Howard, engineer of tests at Watertown, who explained the information as to service conditions furnished by the tests, also as to the quality of the steel. Defects due to wheel pressures, to the impairment of the elastic limit of the steel in the cold straightening of rails, to the heating of the surface of the rail by the slipping of driving wheels, and to the presence of longitudinal streaks in rails, the lines of fracture often following these streaks. It was noted that Dr. Henry Fay, who collaborated in the tests, recognized the presence of manganese sulphide in these streaks. Illustrations of the occurrence of the streaks were given in Mr. Howard's paper before the ninth annual meeting of the American Railway Engineering and Maintenance of Way Association at Chicago, March 19, 1908, and were reproduced in *The Iron Age* of March 26, p. 1000.

Manganese Sulphide as a Cause of Rail Failure.

Dr. Henry Fay, Massachusetts Institute of Technology, presented in an elaborate paper, "A Microscopic Investigation of Broken Steel Rails: Manganese Sulphide as a Source of Danger."

The first piece examined was a small section broken out of the foot of a rail and having a good-sized check. The metal was cut through just beyond the check and polished to a mirror surface. The surface was pitted badly on a line with the check, and under the microscope manganese sulphide was shown where the pitting had taken place. The appearance of pitting from slag is usually quite different. Examinations were then made of a number of rails which had broken in the foot in the crescent form. Near the top surface of the fractured piece the metal in nearly every case showed a thin layer of more brittle material, and in many cases fine checks extending in the direction of rolling. In each polished specimen manganese sulphide was found in considerable quantities, either alone or accompanied by ferrite. Tests were made demonstrating the brittleness of the manganese sulphide, also that it was cemented but weakly to the steel in which it was embedded. Other fractures besides crescent breaks were also found to be connected with manganese sulphide. The form in which the sulphide exists determines whether it is harmful. If the metal has been forged the sulphide will appear in small spherical masses. If there has been rolling, begun at high temperatures, the sulphide areas will be elongated, as in the crescent breaks.

Le Chatelier has stated that as sulphide of manganese often appears crystallized it has a higher freezing point than any other of the constituents. This has been granted by some experimenters and questioned by others. The author detailed an experiment by which he had determined the freezing point of manganese sulphide to be 1162 deg., refuting Le Chatelier's claim, and explaining the elongated masses of the sulphide. If rolling begins at any temperature above 1162 deg. the manganese sulphide will still be liquid from the temperature at which rolling began down to 1162 deg., and below this temperature being in a plastic condition it is elongated in the direction of rolling. It appears in elongated threads where rolling pressure is exerted on three sides. An examination of flat bars will be made to see if it appears, as is to be expected, in flattened, elongated masses where the rolling pressure is on but two sides.

Specifications should be so drawn as to limit the amount of sulphur in the steel. Then the metal should be allowed to stand longer after the ferro-manganese addition. With specific gravity of manganese sulphide 3.966 and of steel 6.82 the former should rise to the surface and be skimmed off with the slag if given sufficient time. Usually the interval between the ferro addition and pouring is very short. But if a low sulphur ore is not available to start with, or if a sufficient time cannot be given for the removal of manganese sulphide, a resort must be had to electric refining of the molten metal by means of a basic slag.

Failures from Split Heads.

M. H. Wickhorst, engineer of tests of the Chicago, Burlington & Quincy Railroad, Aurora, Ill., read a paper on "Rail Failures—Mashed and Split Heads." He presented a characteristic example in an etched section of a

100-lb. rail. The investigation and conclusions are in substance as follows:

A rail about to fail in this way first shows its weakness in a dark streak along the head, several feet to several yards long. The head starts to sag down on one side or both and spreads somewhat. The rail shown was the top rail of the ingot. Analysis disclosed considerable segregation of carbon, phosphorus and sulphur. Longitudinal and transverse test pieces were taken from the middle of the head and just below. The former showed good tensile strength, while elongation and reduction in area were very low. The transverse tests showed low tensile strength and no elongation. Because of segregation, the metal is unable to withstand the internal tensile stress, the load coming on the head more or less to one side on account of the wear of the tread of the wheel or the canting of the rail. A crack develops internally and increases until it breaks through on the under side of the head where it joins the web. The speaker considered it probable that the great majority of failures called pipes by trackmen are really split heads, occurring as he had described.

General Discussion.

After the paper of E. F. Kenney, Cambria Steel Company, Johnstown, Pa., of which a large part is printed on another page, had been read, the question of rail failures was thrown open for general discussion. Wm. R. Webster referred to the elaborate programme of investigation which had been blocked out, including rail steel in all forms from the ingot to the finished rail.

The statement was made that the planes of cleavage formed in the rolling of rails are at right angles to the direction of pressure and that they exist independently of manganese sulphide. It was added that they constitute a strong argument for a deeper head. Mr. Fay remarked in this connection that the point to be emphasized relative to manganese sulphide is that when it is found a crack may be predicted; it does not explain all characters of breaks, however.

J. P. Snow, bridge engineer of the Boston & Maine Railroad, enlarged upon the data relative to rolling flaws which he brought to the attention of the Maintenance of Way Association at its Chicago meeting in March. A synopsis was given in *The Iron Age* of March 26, page 1001. Mr. Snow showed specimens taken from rails which had failed in track, and illustrated the different kinds of flaws. One he attributed to a gas seam; another was an example of what he called a rolling flaw. The bulk of the flaws which he had investigated in the past year he assigned to the latter class. On the Boston & Maine Road crescent shaped breaks in the base of the rail are more frequent than other forms of failure, while on other roads with heavier traffic split heads are the most numerous class.

Leaves from the Early Bessemer Book.

Capt. R. W. Hunt said he was gratified to find that some of the things he and others had been harping on for years are at last being recognized by the present generation. It has long been known that sounder ingots could be made by pouring through smaller nozzles; also that ingots of smaller section and of less length will result in a better finished product than that from large and long ingots; and further, that time should be given for the necessary chemical reactions after recarburizing in the Bessemer process. The speaker cited some of the precautions taken in the earlier days to secure sound steel, such as putting blooms under the hammer and chipping out defects by hand. He referred to an incident in his experience at Johnstown, Pa., when associated with John E. Fry and Capt. Wm. R. Jones, which might be considered the genesis of the Gjers soaking pit and the Hainsworth furnace. An important consideration is the allowance of sufficient time after the ingot has been placed in the vertical position in the pit furnace before it is put in horizontal position on the rolling mill table. A number of improvements in the practice of prominent rail mills have recently come under the speaker's observation. At one plant ingots are being cast of a length that makes but three rails. The taper of ingots has been reduced at this plant, and they are being cast through a smaller nozzle, while more time is allowed to elapse before taking the ingots out of the vertical position. In one case the percentage of seconds has been divided by two, and at another plant by four. The introduction of

the dry blast has also given good results as applied to the Bessemer converter.

C. E. Stafford referred to experience with rail steel some years ago at the Pennsylvania Steel Works. It was found that usually the greatest number of seconds were produced near the changes of turn, the trouble being particularly noticeable in the blooming mill. The tendency was to put too much reduction on the ingot in the first passes. The production of seconds he regarded as not due altogether to the quality of steel, but to the treatment it received in the roughing and finishing passes of the rail mill. He believed that as a result of recent investigation there would be a return to some of the methods formerly in use which had been abandoned under the pressure for tonnage.

Changes in Specifications Adopted.

Following the discussion, the recommendations of the Rail Committee were taken up and adopted, as referred to in the early portion of this report. The change in the percentage of seconds was objected to by P. E. Carhart, who held that as this was purely a commercial question it should be left to agreement between the mill and the buyer. In answer it was pointed out that the new provision practically does this in specifying that No. 2 rails shall be accepted to at least 5 per cent. of the whole order, so that the prevailing arrangement of 10 per cent. seconds, or any other, can be adopted if desired.

PRESERVATIVE COATINGS.

The sessions of Thursday were devoted to cement and concrete, the programme including reports from Committee C on Standard Specifications for Cement and Committee I on Reinforced Concrete, in addition to a number of interesting papers. The seventh session, that of Friday morning, was introduced by S. S. Voorhees, chairman, who read the report of Committee C on Preservative Coatings. Details were given of progress in the past year in continuation of the service test on the Pennsylvania Railroad bridge over the Susquehanna River at Havre de Grace. The analysis of the 57 paints applied to the 19 sections of this bridge has been completed. The method followed in these analyses was detailed in a paper following Mr. Voorhees' report, read by J. F. Walker, chemist. Concerning the various paints on the Havre de Grace bridge the report said that in general they are affording good protection, and it will require longer exposure to differentiate in the majority of cases. The only example of an asphaltum coating thinned with a petroleum volatile solvent has failed to a marked degree after 18 months' exposure. A carbon paint containing rosin in the oil has developed minute fissure cracks all over the surface. It is also noted that one of the pure red lead pigments in straight linseed oil shows unmistakable evidence of alligatoring. The report referred also to the big fence which the paint manufacturers have erected in North Dakota for the testing of paint and to additional tests which have been arranged for at Atlantic City and Pittsburgh.

A. S. Cushman referred to the vogue which chrome pigments had had in the past year, following the publication of the results obtained by using zinc chromate as an inhibitor of corrosion. As some of the chrome pigments inhibit while others stimulate electrolytic action, the speaker urged that some caution in this direction is advisable.

G. W. Thompson, New York, read a paper on "Certain Solubility Tests on Protective Coatings." He took the view that the protective coating which gives the lowest per cent. of soluble matter is to be preferred.

The topic, "Will Pure Paint Legislation Give Us Better Paints?" was discussed by a number of representatives of manufacturing interests, including C. D. Rinald, C. B. Heckel and J. Dewar. Little was added by these addresses to the sum of knowledge concerning protective coatings, and the injection of purely commercial considerations into the proceedings of the society was met with some protests. The aim of the speakers seemed to be to put in as unfavorable a light as possible the efforts of those who have been instrumental in getting the so-called "pure paint" legislation on the statute books of several States.

One point of interest was brought out at the end of the morning's discussion—namely, that in some paint tests conducted by the Philadelphia & Reading Railroad the cheapest paint proved to be the best covering. It was stated that this contained 58 per cent. of calcium sulphate and 23 per cent. sesquioxide of iron. Another incident of the discussion was the protest of L. S. Hughes, Joplin, Mo., against accepting as representative of conditions in actual service, the laboratory tests made by Dr. Cushman and offered by him in support of the electrolytic theory of corrosion.

TESTING AND TESTING MACHINES.

T. D. Lynch, Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., in connection with a paper on the "Use of the Extensometer in Commercial Work," gave plotted results of experiments with various kinds of steel under three conditions: 1. As they came from the mill; 2. After oil tempering and annealing; and 3. After oil tempering without annealing. The curves represented the relation between yield point and elastic limit. One deduction from the experiments was that the real elastic limit is farther from the tensile strength than is commonly regarded. Commenting on the paper, J. J. Shuman of the Jones & Laughlin Steel Company, Pittsburgh, suggested that it is unfair, in view of the results shown, to make specifications providing that the elastic limit shall be at least 50 per cent. of the tensile strength. He hoped the society would discourage specifications with such a proviso. Dr. Dudley added that a safe stress in any metal is a hard thing to arrive at apart from a consideration of the conditions under which it will be used.

T. Y. Olsen, Philadelphia, followed with a description of a 600,000-lb. universal testing machine, three of this type having been installed—one at the structural testing laboratory at St. Louis, a second in the engineering department of the University of Pennsylvania, and a third at Rensselaer Polytechnic Institute, Troy, N. Y. He also described a new form of pendulum testing machine, made by the same company.

There were also presented at this session the report of Committee G, on the "Magnetic Testing of Iron and Steel," J. W. Esterline, chairman; also papers on "An Autographic Recorder for Commercial Tension Tests," by H. F. Moore, and "Uniformity in Magnetic Testing and in the Specifications of Magnetic Properties," by C. W. Burrows.

More Stringent Specifications for Boiler Steel.

Col. E. D. Meier, chairman of Committee R, on Uniform Specifications for Boilers, read its report, which found a text in the regulations adopted by the Board of Boiler Rules in Massachusetts, published March 24, 1908. Though drastic in some of the requirements they put upon boiler works, these rules, the committee believe, will in time be adopted by other States. The specifications for boiler steel are those of the American Society for Testing Materials. The committee considered that this put a fresh responsibility upon the society and called for improvement in these specifications. It recommended a change in the chemical properties prescribed. These are now for phosphorus as follows: Flange or boiler steel, 0.06 per cent. for acid and 0.04 per cent. for basic; for firebox steel, 0.04 per cent. for acid and 0.03 per cent. for basic; for extra soft steel, 0.04 per cent. for both. The sulphur limits for the three kinds of steel are 0.05, 0.04 and 0.04 per cent. respectively. The committee favored making the requirements for acid steel the same as for basic and for extra soft steel the same as for firebox. This would give 0.04 and 0.03 and 0.03 per cent. respectively for the three qualities of steel. At present the sulphur limits are 0.05, 0.04 and 0.04 per cent. respectively. The committee favored a reduction to 0.03 per cent., saying that in the chairman's experience a boiler steel containing more than 0.03 per cent. sulphur cannot safely be employed. The American Boiler Manufacturers' Association specification providing 0.04, 0.035 and 0.035 per cent. sulphur, respectively, was a compromise with the manufacturers, 0.03 per cent. having governed from 1889 to 1905. The committee took the position that if steel makers can meet the necessities of the automobile builder by furnishing axles and braces

of 120,000 lb. tensile strength, they can rise to the demand of the vastly more extensive steam boiler industry. Lack of uniformity in plates and tubes, it was stated, is being met with at a time when crystallization is developing quite rapidly at the higher pressures demanded by modern steam practice. It is deemed of utmost importance, the report said in conclusion, that the society's specifications for boiler steel be revised in accordance with the suggestions made above. The recommendation was referred to Committee A, on Standard Specifications for Iron and Steel. One member's comment on the report was that in view of the practical exhaustion of natural gas and the nearly complete dependence on producer gas, steel under 0.03 in sulphur is much more difficult to secure.

THE FINAL SESSION.

For the ninth session of the meeting, that of Saturday morning, a miscellaneous programme of papers and reports was scheduled. R. L. Humphrey reported on the work done in sand and cement testing in the past year at the structural materials testing laboratory of the United States Geological Survey, at St. Louis. A paper on "Manganese Bronze" was presented by C. R. Spare, also papers on the "Desirability of Standard Specifications for Hard Drawn Copper Wire," by J. A. Capp and W. H. Bassett, and on the "Effect of Combined Stresses on the Elastic Properties of Steel," by E. L. Hancock.

On Friday evening an informal dinner was given at the Hotel Traymore, attended by about 75 members. Willard Smith was toastmaster, and responses were made by Chas. B. Dudley, R. W. Lesley, F. P. Cheesman, R. W. Hunt, and G. W. Thompson.

The registration reached 280, the largest on record. The plan of having the sessions extend over five days, avoiding simultaneous sessions of different sections, and giving intervals for recreation, also bringing sessions on kindred subjects within a space of two days, so that attendance throughout the entire meeting is not necessary, seemed to work well, and will probably be continued at other meetings.

The Iron and Steel Electrical Engineers.

The Association of Iron and Steel Electrical Engineers, which was formed last year in Pittsburgh, Pa., and which comprises as its members the electrical engineers in charge of the electric installations in the large iron and steel producing plants, held its first annual convention at the Engineers' Club, Philadelphia, Pa., June 24 to 26. The convention was well attended. It was called to order on Wednesday morning by the president, James Farrington, who made a brief address of welcome.

The meetings on the first day of the convention were of an executive nature. The Executive Committee presented its report, which included recommendations for increase in its membership and the publication of a year book, which, as the official organ of the association, would print the papers presented and their discussion. The secretary and treasurer presented their annual reports. The question of the standardization of mill motors was discussed at length at the morning session, and efforts will be made to have all the members approve certain types of motors, which would then be made and carried in stock by the principal manufacturers of motors and electrical equipment.

A report was presented by G. H. Winslow, Pittsburgh, on the "Operation of the Stoeckel Induction Drive," while the subject of "Electric Drilling and Reaming" was discussed by F. W. Stevens, Ambridge, Pa. George W. Richardson, Philadelphia, Pa., presented a paper on "Electric Motors for Heavy Torque and Rapid Reversal." At the afternoon session A. P. Stoeckel, Wheeling Mold & Foundry Company, Wheeling, W. Va., presented a paper on "The Induction Drive," demonstrating his subject by means of a working model showing the operation of the rolls and clutches. E. W. Yearsley, Philadelphia, followed with a paper on "Electric Motor Drives."

Open sessions of the association were held on Thursday. After the transaction of routine business, H. D. James of the Westinghouse Electric & Mfg. Company,

Pittsburgh, presented a paper on "Control of Motor Operated Auxillary Apparatus for Steel Mills," and B. Wiley of the same company presented a paper on "Electrical Equipment of Rolling Mills." The Cutler-Hammer Company, represented by C. T. Henderson, exhibited and described by papers its new resistance grid interlocking systems and controlling apparatus at Gary. The association then adjourned to the Hotel Walton, where the members lunched as the guests of the Crocker-Wheeler Company.

At the afternoon session a paper on "Combination Manual and Magnetic Switch Controllers" was presented by H. F. Stratton, Electric Controller & Supply Company. R. C. Hill, Electric Storage Battery Company, Philadelphia, presented papers on "The Storage Battery in Steel Mills" and "Storage Battery Regulations of Alternating Current Circuits."

The General Electric Company offered papers on "Mill Motors," "Rolling Mill Apparatus," "The Interchangeability of A. C. and D. C. Motors" and "Lightning Arresters." The Crocker-Wheeler Company presented papers on "Standard Rolling Mill Motors." The papers of both the foregoing companies were illustrated by means of lantern slides. The closing paper of the session was by C. J. Toerring, on "The Flame Arc Lamp." After a general discussion of topics of interest the convention, as far as meetings were concerned, came to a close. No official business was transacted, the object of the meeting being to bring about a closer relationship between the members and to co-operate with the manufacturers of electrical equipment for mill service, with a view of eliminating unsatisfactory types and adopting in the future standard types of the various equipment. The annual session for the election of officers and transacting the business of the association will be held in October. On Thursday evening the association was the guest of the Westinghouse Electric Mfg. Company, which entertained the members with a trip to Willow Grove Park, while Friday was given to visits to plants, which included those of the American Bridge Company, Pencoyd; Electric Storage Battery Company, Philadelphia, and New York Shipbuilding Company, Camden, N. J. The principal officers of the association are as follows: President, James Farrington, La Belle Iron Works, Steubenville, Ohio; vice-presidents, John C. Reed, Pennsylvania Steel Company, Steelton, Pa., and G. M. Sturgess, Lackawanna Steel Company, Buffalo, N. Y.; secretary, G. H. Winslow, National Tube Company, Pittsburgh, Pa.; treasurer, E. W. Yearsley, Midvale Steel Company, Nicetown, Philadelphia.

A Deep Artesian Well in South Dakota.

For many months a big well-drilling machine had been boring into the dry ground of the Black Hills region of South Dakota alongside the track of the Burlington Railroad at Edgemont. Down went the drill, until the native onlookers wondered whether the railroad company had fixed no limit to the bore, and was simply "going it blind," indefinitely. The company's intention was very definite, indeed. Its officials had been informed by a geologist of the United States Geological Survey that a good supply of water would be found in a certain stratum of rock that lay at a depth of about 3000 ft. This geologist had made a study of the surface outcrops of the rocks of the region, and had based his prediction on that study. And, having faith in the prophesy, the company determined to drill to that depth. It was not necessary, however, to bore quite to the depth of 3000 ft., for when the drill had gone down 2980 ft. water gushed out at the rate of 350 gal. a minute, and the faith reposed in the judgment of the geologist was justified. This water supply fills a need which is so urgent that if anything should happen to destroy this well the railroad company would not hesitate to bore its counterpart.

It is computed that the appraised value of foreign goods entered at New York in the year ending June 30 amounted to \$714,170,714, compared with \$852,050,780 for the fiscal year ending June 30, 1907. A heavy falling off is noted in the entry of precious stones and automobiles.

The Barnes 12-22 In. Gap Lathe.

A lathe particularly designed for automobile garage and general repair shops where there are frequent jobs requiring more swing or greater distance between centers than can be obtained on the ordinary small lathe is a new product of the Barnes Drill Company, Rockford, Ill. The lathe as illustrated herewith is known as a 12 and 22 in. sliding extension gap engine lathe, and is equipped with a sliding top bed, by the movement of which a gap may be formed of whatever width may be needed to suit the requirements of the work. This same movement not only increases the swing of the lathe, but also the distance between centers. Fig. 1 shows the machine and the equipment which is furnished with it, and in the condition as here shown the lathe is one of 22-in. swing, suitable for large work. It has no removable section, which has to be inserted in the ordinary stationary gap lathe. Fig. 2 shows a detail of the lathe when the gap is closed. In place of the countershaft power drive, foot-power drive can be furnished when required.

The bed is described as very broad and deep and well braced, and accurately proportioned throughout. The top and main beds are fitted together by a dove tail construction which permits the top bed to be held firmly at any position by clamp bolts transversely placed through the main bed. To extend the gap the top bed is drawn back by the screw and crank at the rear end. The carriage rack and pinions are cut from steel, the rack is in one piece.

The headstock is heavy and strong and carries a hollow spindle, which runs in large bronze bearings. The cone pulley has four steps for a 2-in. belt and is back geared, giving eight changes of speed. A push pin on the head gear allows the cone to be instantly locked or unlocked without need of a wrench. The tailstock is of the off-set type, allowing the compound rest to be set parallel with the bed, and has a set-over adjustment for taper work.

The carriage is extended in front and is unusually strong, to provide a firm support to the turning tool when doing work in the gap up to the limit of the swing. The carriage is fitted to the bed with a long bearing on the V front and a flat bearing in the rear. It is gibbed and can be conveniently and quickly clamped to the bed for cross feed work. The carriage is also fitted with T slots for clamping on work. The compound rest has a graduated base and is gibbed and has sufficient travel for the largest capacity of the lathe. Power feeds both longitudinal and cross are provided, and the necessary change gears are furnished for cutting, either right or left hand,

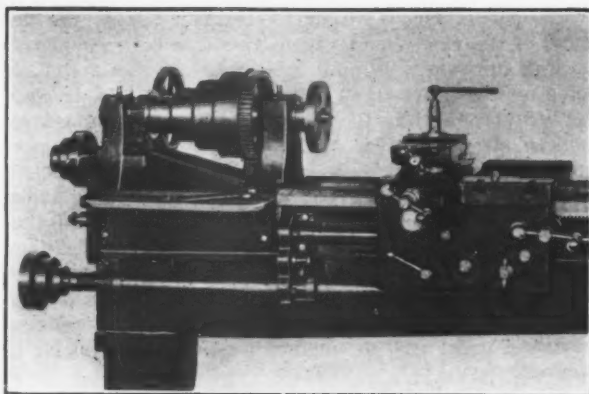


Fig. 2.—Detail of the Barnes Gap Lathe, Showing the Gap Closed.

all threads from 2 to 18, including $11\frac{1}{2}$ pipe threads, and by twos from 18 to 36, and by fours from 36 to 48 threads per inch. The actual swing over the bed is 13 in., and over the carriage $8\frac{1}{2}$ in., and through the gap $22\frac{1}{2}$ in. The ratio of the back gearing is 8 to 1. The center rest will admit a 4 in. diameter piece of work. The lathe when built in $5\frac{1}{2}$ -ft. bed length takes between centers when the extension bed is closed 36 in., and with the bed extended 54 in., the gap opening 18 in. The net weight of the machine, including the countershaft, is 1155 lb.

The diversity of views concerning business prospects is illustrated in the following: J. P. Morgan considers that business conditions have greatly improved and will continue to improve. President Mellen of the New Haven road refers to June as little better than May, which he calls the worst month since the panic. He finds no indications of a return to sustained activity. Alfred Blenzig, a Deutscher bank manager, who has recently traveled in this country, believes recovery from the panic will be slower than is generally expected.

W. C. Brown, senior vice-president of the New York Central Lines, who has spent five weeks studying crop conditions in the West and Northwest, says that in the 40 years he has visited those sections he has not seen the general average as good as it is now. He reports the Western railroads in good shape and not needing work on their roadbeds. All have postponed replacement of rails as much as possible, and, in Mr. Brown's opinion, the rail purchases of 1908 are practically over.

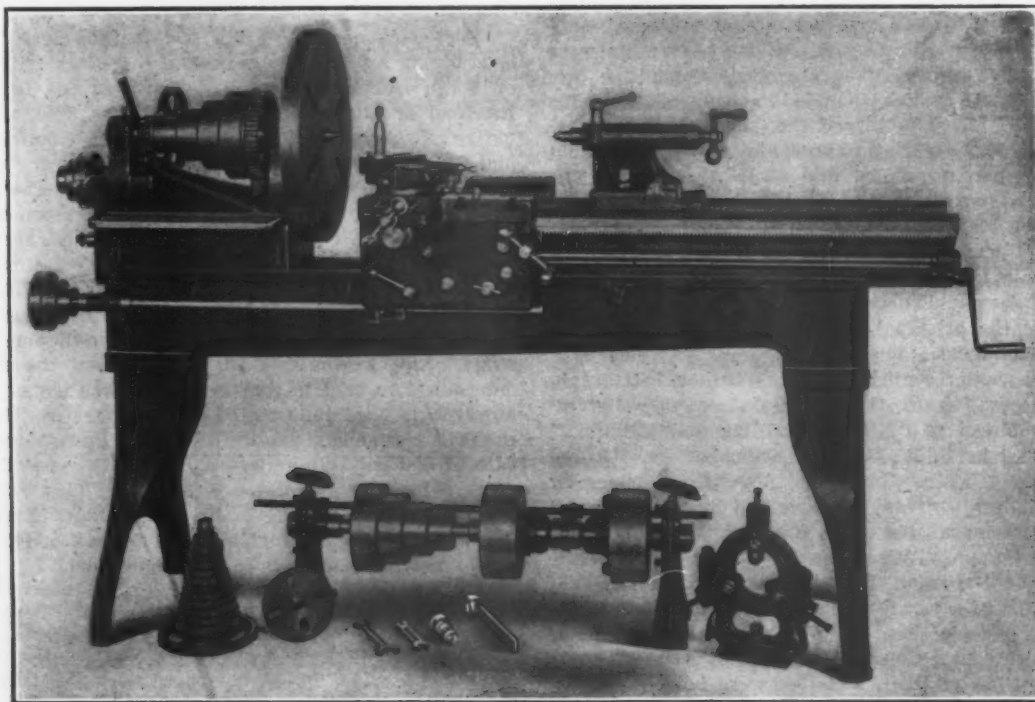


Fig. 1.—The 12-22 In. Gap Lathe Built by the Barnes Drill Company, Rockford, Ill., Showing the Gap Open.

No. 12 Gardner's Improved Disk Grinder.

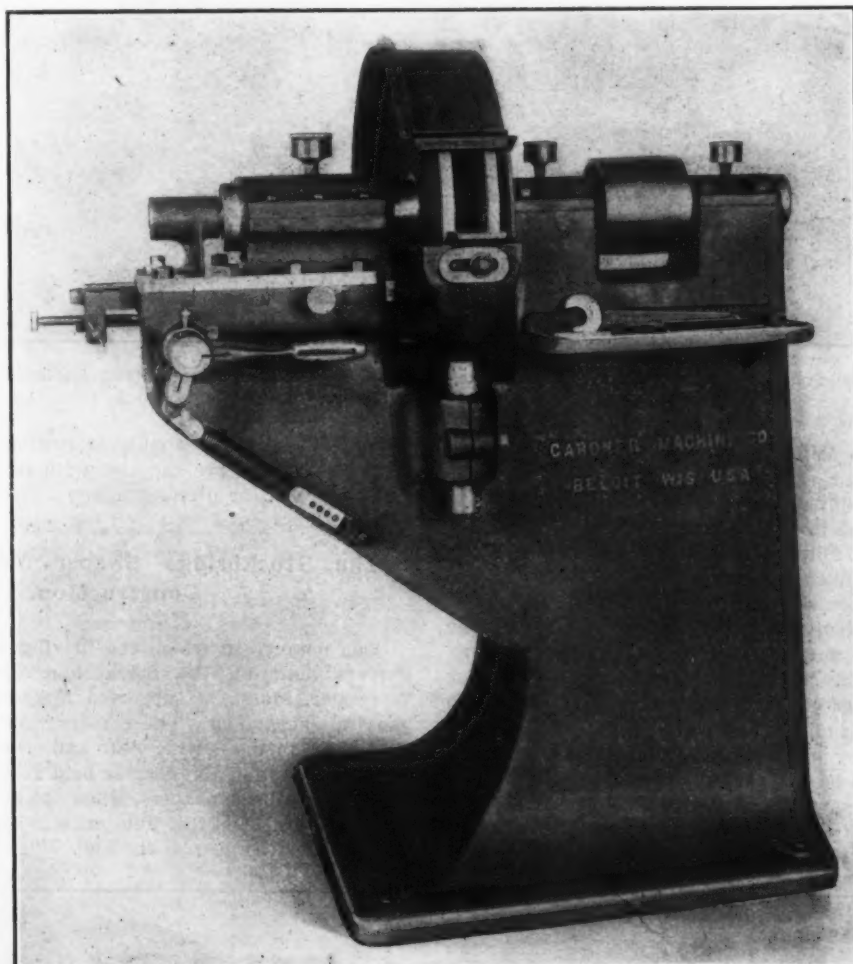
The accompanying illustration shows a departure in disk grinder construction. This machine, which is built by the Gardner Machine Company, Beloit, Wis., is designed for rapid grinding of small pieces having parallel faces to be finished, such as bolt heads, square or hexagon nuts, wrenches, thrust collars, die blanks, reamer blades and thread die chasers, also typewriter, sewing machine, firearm parts, &c. Its modified design was occasioned by the frequent need of a smaller double head disk grinder than the No. 14 grinder built by this company, and described in *The Iron Age* January 2, 1908. Patents are now pending covering the new machine.

The principal feature of the No. 12 machine is its one belt drive. The left-hand disk wheel is mounted on a hollow spindle supported in the sliding head. A driving shaft coupled to the spindle carrying the right-hand disk

from $\frac{1}{8}$ down to 1-32 in. in thickness is being ground. By means of this back stop the backward travel of the sliding head is confined to the least required to admit the piece to be ground between the wheels, and thus removes the liability of the work being caught between the wheels and the work rest.

The machine throughout is rigidly constructed, and lubrication and the exclusion of dust from all wearing surfaces carefully provided for. Disk wheels of either 15 or 18 in. diameter may be used. The maximum distance between wheels is $4\frac{1}{4}$ in., which in a great majority of cases is ample. This space may be increased to suit special cases. The weight of the machine as illustrated is 1050 lb. With all accessories, including setting up press for wheels, countershaft, supplies, &c., crated for domestic shipment the weight is 1800 lb.

The Remington Typewriter Bonus.—The eleventh half-yearly bonus distribution to the employees of the



The No. 12 Disk Grinder Built by the Gardner Machine Company, Beloit, Wis.

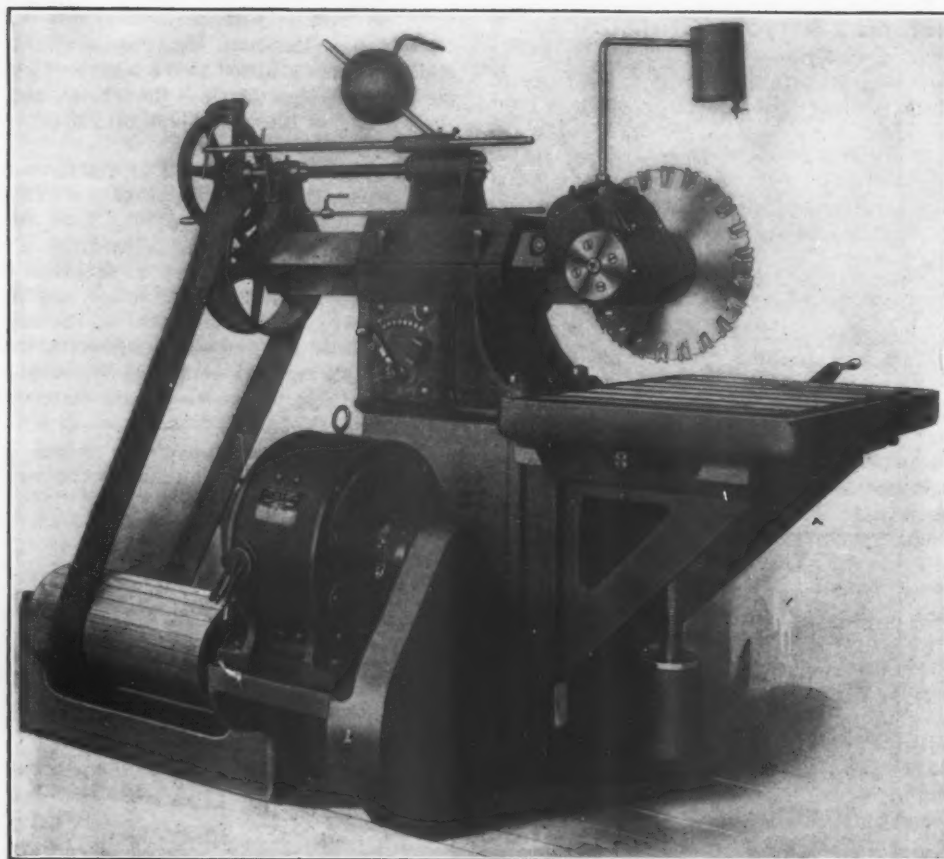
wheel and driving pulley, drives the hollow spindle carrying the left-hand disk wheel. The driving shaft is splined to engage a key fastened in the hollow spindle, and is provided with dust proof collars to exclude dust from the hollow spindle.

To remove the disk wheels from the machine it is only necessary to uncouple the driving shaft of the left-hand head from the main spindle of the machine. The end of the driving shaft is made with a left-hand thread and taper seat, and the main spindle of the machine is bored and threaded to fit it. The sliding head may be removed and special work table or fixtures used in connection with a single wheel. The disk wheels are fastened to the spindles by the usual countersunk screws.

The sliding head is operated by a hand lever, which is directly connected to a steel cut pinion operating in a steel cut rack fastened to the under side of the sliding head. The sliding head is equipped with micrometer stop screws and back stop. The back stop is important in double disk grinding, especially where thin work of

Remington Typewriter Works, Ilion, N. Y., took place June 30. The sum of \$14,000 in gold was distributed among 280 employees selected for diligence and efficiency during the past six months, and whose periods of continuous service at these works ranged from 10 to 35 years. Including this sum, \$145,000 in all, has now been distributed under the bonus scheme. The prizes and certificates for good suggestions adopted during the half year were awarded at the same time.

Alexander Agassiz, president of the Calumet & Hecla Mining Company, testified last week in a suit at Boston, brought to restrain control of the Osceola Company by the Calumet & Hecla, that the life of the latter's mine on the Michigan conglomerate may be put at 12 to 15 years. It is hoped, he said, to develop sufficient copper on the properties purchased recently to make up for the diminution of the old mine. The machinery of the Calumet & Hecla he estimated at \$10,000,000, besides several million dollars in buildings and other surface property.



The Latest Wagner Cold Saw Built by the Birdsboro Steel Foundry & Machine Company and Equipped with a Westinghouse Driving Motor.

The Wagner Cold Saw.

The accompanying illustration shows a Wagner cold saw, manufactured by the Birdsboro Steel Foundry & Machine Company, Birdsboro, Pa., equipped with a Westinghouse type S direct current semienclosed constant speed motor. The cross feed of the work table, in connection with the vertical movement, enables the work to be brought up to the saw without blocking, except enough to level the casting. This saw is especially designed for small work, such as cutting off sink heads. It may also be used for cutting miters or bevels, as the head may be turned through any angle desired. Where the hardness of the material to be cut varies considerably the peripheral speed of the saw can be varied, if a variable speed motor is used for the drive. A heavier type of cold saw manufactured by this company is built in several sizes

up to a 50-in. saw, capable of cutting through a 16-in. bar. These saws are supplied with motor drive through a chain or belt or direct gearing.

The Stockbridge Shaper Main Bearing Construction.

The manner in which the driving mechanism of the shapers built by the Stockbridge Machine Company, Worcester, Mass., is supported is shown in the accompanying engravings. The construction is different from that usual in the driving gear and crank; with the ordinary construction the gear is held from the central hub entirely. On large shapers, when out on their full stroke, the strain put upon this hub tends to buckle the gear and often breaks the gear at the hub. Buckle in the gear pro-

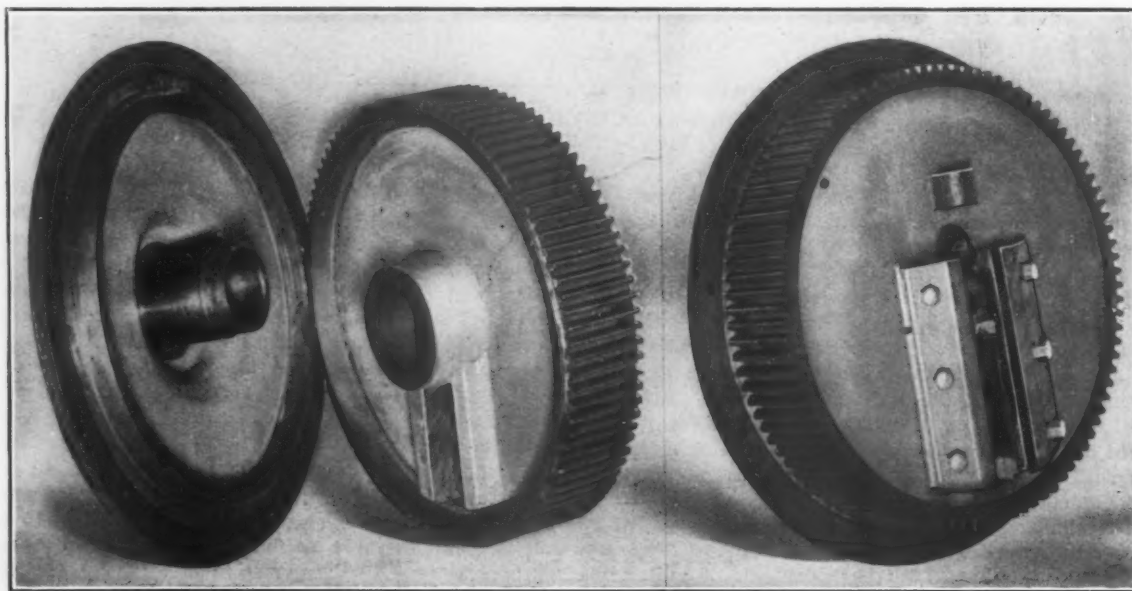


Fig. 1.—The Gear and Main Bearing.

Fig. 2.—The Parts Assembled.

Main Bearing Construction Used on the Stockbridge Shapers.

duces unevenness in the stroke of the ram, which results in chatter marks on the work.

Patents have been applied for on the construction illustrated. Fig. 1 shows the gear and main bearing. The latter has a flange which is turned to a running fit in the overhang on the periphery of the gear. The flange bottoms on the gear casting and makes a support for the gear, relieving the central hub from strain, preventing possibility of buckle in the gear, and insuring a smooth and even cut regardless of the length of the ram stroke. This construction adds considerably to the stiffness of the driving mechanism and makes it possible to take a much heavier cut than if the gear were not supported in this way. Fig. 2 shows the parts assembled. When the main bearing is bolted to the column this becomes an integral part of the shaper.

Poor's Manual for 1908.

Poor's *Manual* for 1908 (forty-first annual number) is issued. Although the work appears some two months earlier than last year and five months earlier than in 1906, yet it is as complete as ever, covering the 1907 fiscal and calendar years, and containing information concerning the more important companies up to June 10, 1908.

An important feature of this edition is an enlarged industrial section embracing every prominent corporation in the United States from which a report could be obtained. Information is strictly up to date, and in the case of the larger companies includes elaborate tables showing income accounts and balance sheets in comparative form for a series of years. In general treatment the industrial section compares favorably with the railroad section.

The total mileage of the steam railroads of the United States December 31, 1907, was 228,128 miles, as against 222,766 miles December 31, 1906, showing an increase of 5362 miles.

The total capital liabilities of the railroads, including stock, bonds and other indebtedness, was \$16,501,413,069, showing an increase of \$907,864,112. Of this increase \$351,717,809 is represented by stock, and the balance by bonds and other forms of indebtedness.

The following table shows the income account of American railroads for the year 1907 as compared with 1906:

	1907.	1906.
Miles of railroad operated.....	225,227.23	220,633.33
Passenger earnings.....	\$574,718,578	\$521,231,337
Freight earnings.....	1,825,061,858	1,659,925,643
Other earnings.....	202,977,067	165,483,306
Total gross earnings.....	\$2,602,757,503	\$2,346,640,286
Operating expenses.....	1,769,417,903	1,556,452,574
Net earnings.....	\$833,339,600	\$790,187,712
Other receipts.....	128,015,081	100,292,369
Total net income.....	\$961,354,681	\$890,480,081
Taxes.....	\$74,253,245	\$68,169,833
Interest on bonds.....	280,931,001	269,926,395
Other interest.....	23,759,329	13,107,169
Dividends on stock.....	247,258,219	225,601,245
Miscellaneous.....	75,176,725	79,806,024
Rentals—Interest.....	38,188,406	39,612,179
Dividends.....	31,087,374	27,739,680
Miscellaneous.....	18,127,456	15,042,783
Total payments.....	\$788,781,755	\$739,005,308
Surplus.....	\$172,572,926	\$151,474,773

Interesting traffic statistics are as follows:

	1907.	1906.
Passengers carried.....	885,724,314	815,774,118
Passenger mileage.....	28,370,247,819	25,842,462,029
Revenue per passenger mile....	2.040 cents.	2.011 cents.
Tons freight moved.....	1,722,210,281	1,610,099,829
Freight mileage.....	233,137,507,807	216,653,795,696
Revenue per ton-mile.....	0.782 cent.	0.766 cent.

The Wellman-Seaver-Morgan Engineering Company, Cleveland, reports much improvement in inquiries for ore and coal handling machinery, both from Western mines and from Pennsylvania coal mines. Inquiries are coming from large concerns that have been purchasing no equipment for several months past, and the company expects soon to begin work on some good orders.

Railroads Require Better Packing.

By reason of the losses which have been suffered by both railroads and shippers, because of improper and insecure packing of freight, the 416 lines of the Official Classification territory have decided, beginning July 1, to require the use of more secure boxes.

At the present time, Official Classification Rule 2 (B) stipulates that "Property packed in boxes or cases made from strawboard, leather board, wood pulp, fiber, wired splintwood, or other analogous material, will be charged 10 per cent higher than the classification provided for such property." It is now intended to penalize by adding 20 per cent to the regular rate on all packages not packed in strong boxes coming up to requirements which are set forth with great details in the new rule covering this point.

It is believed by railroad traffic experts that the introduction of cheap substitutes for substantial wooden cases is responsible for a large number of "damages" to goods in transit which should not occur. American Consuls abroad have long protested that bad packing lost a vast amount of trade to American exporters. The abuse has become of equal seriousness in respect to domestic shipments.

The railroads regard it as impossible to prevent damage under such conditions. It is believed that the time will come, unless shippers are more careful in their packing, when the carriers will be forced to specify exactly how all commodities shall be packed, and refuse to receive them for shipment unless the rules are observed. In an address before the Traffic Club of Pittsburgh, C. E. E. Childers, joint agent of the Trunk Line Association in that city, said on the subject of proper packing of freight:

Of what avail is it to move a shipment from origin to destination in record time if, upon its arrival, the goods are damaged or destroyed? The carrier's energies on the one hand have been devoted to quick handling of traffic, while the shippers, on the other hand, have been endeavoring in too many cases to meet the increased cost of packing by the use of cheaper and flimsier material. With all the improvements that have been made in transportation there is now actually more liability of injury to goods in transit because unreasonably light instead of reasonably strong packages are used.

The Pennsylvania Railroad, for instance, paid out last year \$452,000 in claims for goods damaged en route. Other railroads have paid out amounts equally proportionate to their gross traffic. It is the opinion of railroad men that a large amount of these "damages" would never be inflicted if goods were packed with some regard to the ordinary conditions of train movement and freight handling at stations.

The Pocahontas Collieries Suit Dismissed.

An order has been entered in the United States Circuit Court at Lynchburg, Va., dismissing at the plaintiffs' costs the suit instituted January 14 by a minority of the preferred stockholders of the Pocahontas Collieries Company against the Pocahontas Consolidated Collieries Company, Inc. The latter corporation was formed through a merger July 1, 1907, of a company of the same name with the Pocahontas Collieries Company, with a capitalization of \$2,800,000 preferred stock and \$4,520,000 common stock, and an authorized bond issue of \$20,000,000. The terms of the merger provided that the preferred stockholders of the Pocahontas Collieries Company should accept in exchange for their preferred stock in the Pocahontas Collieries Company, the new bonds of the merged company. This provision in the merger not having been exercised by all the preferred stockholders of the Pocahontas Collieries Company, a suit was instituted by those who refused to make such exchange, for the purpose of securing an appraisal under the Virginia laws of their holdings, or, in the alternative, a receivership for the merged company.

The surplus reserve shown in the weekly bank statement for New York City, June 27, was \$66,098,800, the largest amount since 1894. The cash holdings were \$396,480,200, the largest for any week in the history of the New York Clearing House.

A New Springfield Lathe.

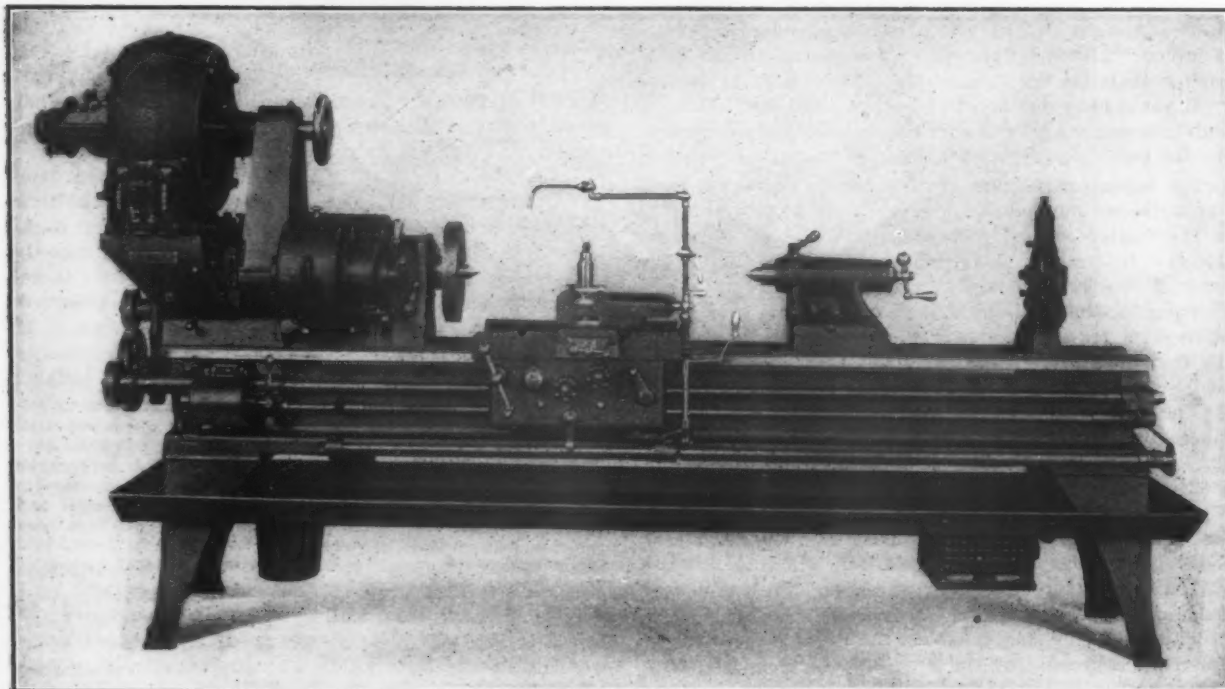
The accompanying illustration shows a motor driven No. 3 high power rapid reduction lathe, recently built by the Springfield Machine Tool Company, Springfield, Ohio. The lathe is neat in appearance and compact, and all gears are protected.

The head is heavily ribbed and tied together where strain may occur, ribs passing between the gears in the upper portion, while the lower portion is heavily ribbed, lengthwise and crosswise. The spindle is exceedingly heavy and runs in large journals of Lumen bearing metal. The journals of the spindle and back shaft are oiled by babbitt rings of triangular section, which deliver a stream of oil, and prevent heating of boxes. The gears in this machine are steel throughout, and the gears which run directly on the spindle are bushed with bronze.

The motor shown in the illustration is of $7\frac{1}{2}$ hp., va-

is designed to carry many times the strain it is ever called upon to withstand. The friction knobs for throwing the gears and longitudinal feeds in and out are made with a series of small beads around the outer circumference, so that the operator can readily get a good grip upon them. The rack pinion is made so that it can be withdrawn at any time, when chasing threads.

This machine, as shown in the illustration, is equipped with the New Standard change gears, which are a modification of the rapid change gear system generally in use. In addition, the lathe is equipped with a rapid feed changing box, which gives six feeds in geometrical progression. The lathe can also be equipped with the Ideal rapid change gears manufactured by the company. With either system the lathe is equipped with automatic stop and reverse; the reverse can be controlled either from the head or the apron. In use the lathe has shown remarkable power, considering that its maximum swing is



The Motor Driven No. 3 High Power Rapid Reduction Lathe Built by the Springfield Machine Tool Company, Springfield, Ohio.

riable speed, from 500 to 1000 rev. per min., and transmits power to the main driving pulley on the spindle through a silent chain. The fast speeds of this machine are obtained by direct drive from the motor to the spindle. The next changes of speed are obtained through one train of gears, consisting of one set of spur and one set of spiral gears. The spiral gears give a smooth, even drive, so that a fine finishing cut may be taken without chatter marks. The next series of speeds are obtained by a double set of back gears, and with the arrangement as above mentioned all spindle speeds from 10 to 285 rev. per min. are obtainable. The clutches in the head are positive steel clutches, but are so arranged that the machine does not have to come to a dead stop before changes can be made. The same lathe, when belt driven, has 10 mechanical changes of speed, and with a two-speed countershaft is designed to give a constant cutting speed of 80 ft. per minute for all diameters from $1\frac{1}{2}$ to 18 $\frac{1}{2}$ in.

The bed is of heavy pattern, well tied together by girts, and has one V and one flat shear. The tailstock is exceptionally stiff and heavy, and has a spindle of extra large diameter to accommodate large centers. A No. 5 Morse taper socket is provided for the tall spindle, and also in the head spindle in connection with a bush.

The carriage is of recent design, in which the weight and bearing surface have been increased, making it very rigid and secure under the heaviest cuts. The compound rest is of new design, and is clamped by bolts on either side. The cross feed screw and compound rest screw have micrometer collars, while the gibs in the compound top and bottom slide are taper gibs. The apron is of the double apron type, with heavy gears throughout, and

19 in.; cuts $\frac{3}{4}$ in. deep have been taken at a cutting speed of 60 ft., with a feed of 5-32 in. in 0.6 carbon steel.

The Pittsburgh Steel Company, Pittsburgh, Pa., and the Tennessee Coal, Iron & Railroad Company, Birmingham, Ala., have placed large equipment orders with the Allis-Chalmers Company, Milwaukee, Wis. These include, for the first named, a horizontal-vertical rolling mill engine of 4000 hp. capacity, and for the second a mammoth two stage air compressor capable of furnishing 5,760,000 cu. ft. of free air per day. It is of interest to note that the rolling mill engine referred to is of the same general type as those operating the Subway and Manhattan power houses of New York City, where machines of over 200,000 hp. have been installed. Similar engines are also in service at the plants of the Illinois Steel Company, National Tube Company and other large industrial works.

The R. D. Nuttall Company, Pittsburgh, announces the establishment of a new department to be devoted exclusively to the manufacture of gears and pinions for air compressors. This company has for some time been supplying gears and pinions for all the standard makes of air compressors. It is owing to the rapidly growing demand for compressed air in a number of important industries that a special department was found necessary. The department will not only be equipped to turn out gears and pinions for the standard types of compressors upon short notice, but will also carry a complete assortment from which immediate shipment can be made.

The Bessemer Process and the Gayley Dry Blast.

Years ago James Gayley, the inventor of the dry blast, expressed the conviction that Bessemer practice would be greatly improved by reducing the moisture in the blast to a practical minimum and securing uniformly low moisture. It was finally decided to test the subject thoroughly at the Bessemer shop of the South Chicago works of the Illinois Steel Company, in connection with the dry air plant erected at the works for a group of the blast furnaces supplying that shop with metal.

Very encouraging results have been obtained in the direction of increased scrap carrying capacity and other items bearing on cost, but the most significant achievement has been in the marked improvement of the product. On that point emphatic testimony comes from the highest authority in the form of the following letter from P. H. Dudley, of New York, the well-known inventor of the Dudley track testing car and expert on steel rail design and rail specifications:

SOUTH WORKS, ILLINOIS STEEL COMPANY,
SOUTH CHICAGO, ILL., June 23, 1908.

JAMES GAYLEY,

First Vice-President United States Steel Corporation,
71 Broadway, New York.

My Dear Mr. Gayley—I have been here at the mill at different times since the last of April having rails manufactured for the New York Central lines.

The first application of your dry blast to the Bessemer practice by William A. Field, the general superintendent, and his corps of able assistants, is of historic and technical interest in the efforts to reduce to a constant the variable element of moisture in the air from day to day to blow the bath of metal in the converter. The effects upon the skin of the ingots are noticeable at once by the absence of pit marks on the sides, except at the extreme top, which is discarded, and the metal blooms as though of greater solidity than usual.

A typical ingot 53 in. long cast in a new type of mold 65 in. high, $17\frac{1}{4} \times 18\frac{1}{4}$ in. on the bottom and $16\frac{1}{2} \times 17\frac{1}{2}$ in. on the top, was cut longitudinally in half without a trace of blow holes on the sides except at the extreme top, which confirmed the previous opinion of the solidity of the steel. The few central blow holes had clean, unoxidized surfaces slightly striated, and seemed to be the center of a limited segregation. Another ingot cast in the old style molds, $18\frac{1}{2} \times 19$ in. on the bottom and $17 \times 17\frac{1}{2}$ in. on top, was cut in longitudinal halves, and had many blow holes and cavities near the top. This was the type of mold in use for many years; and the ingot cracked extensively in the three high blooming train, particularly near the butt end. The dry blast produced an ingot in the old mold which withstood the rapid three high blooming about twice as well as the ordinary blast as measured by the reduction in second quality rails.

Thirty-five sets, 240 in number, of the new style molds were ready for service on the 19th and 20th inst., and were used for 2500 tons of Lake Shore & Michigan Southern and Michigan Central 100-lb. rails. The dry blast was used in the Bessemer converter, the metal recarburized and held in the intermediate ladle three minutes, then turned into the teeming ladle and poured with a $1\frac{1}{2}$ -in. nozzle. The ingots were in the soaking pits about two hours, and bloomed in the three high rapid blooming train; and after the first pass the ingot was turned by a manipulator on the back side of the train. The rails had a good color, were tough and free from seams in the head or base. The oldest employees in the mill said these were the finest 100-lb. rails they ever saw made here. In one lot of 1238 bars on one side of the mill my inspectors found only 14 for rejection.

The average grains of moisture per cu. ft. of air for the two days was 5.98 at the inlet and 1.39 at the outlet of the dry blast. This lessened moisture in the Bessemer converter insures a better and more uniform grade of steel for the consumer and a reduction of second quality rails for the manufacturer. The blooms crop with sound ends, under the usual manufacturer's discard. It is a great step in advance for the Bessemer process from every standpoint of consideration and practical operation.

The blooming of the ingots should be slow and gentle until the skin is toughened, and from general observations the slow running two high trains with light passes at first are best. The control of low or high silicon irons is enlarged. It is stated 60 consecutive heats were blown with direct metal with silicon about 0.60 per cent. last week. We expect to repeat our tests of last week this and also the succeeding week.

I am just as enthusiastic to secure sound ingots as when you visited me in the winter of 1894 at Scranton, Pa.; and the dry blast is an important aid in this humid, hot weather. Very truly yours,

P. H. DUDLEY.

We need hardly allude to the wave of opinion justified by the progress made in favor of the open hearth steel rail, which has coincided with the earnest efforts made by railroad engineers and steel makers alike to adapt the rail to the necessities of the greatly increased burdens of modern railroad service. It is evident from the results obtained at South Chicago that the application of the Gayley dry air blast places the Bessemer converter at least on a parity with the open hearth furnace, as to quality and reliability of product. There has been a disposition in the steel trade to sound "the death knell of the Bessemer process." The results of the application of the Gayley dry blast to the converter will thoroughly re-establish the Bessemer process in the full occupation of the field which the supply of suitable ores entitles it to. In view of the opinions expressed by so eminent an expert as P. H. Dudley, buyers of rails will show less disposition to favor open hearth steel and will suspend judgment while the South Chicago results are being backed up by additional evidence. Even as it is, the facts now available make it certain that a better quality of steel rail can be produced, and that the public will be justified in increased confidence in the safety of travel.

Canadian Tariff Notes.

TORONTO, June 29, 1908.—Mr. Paterson, the Canadian Minister of Customs, has given notice of certain amendments to be made in the Customs act in the present session of Parliament. Two of these are for facilitating the work of customs officials, and one prescribes and imposes a new tariff duty. The last named is in the interest of the Canadian shipbuilding industry. It provides that repairs to vessels and their equipment shall be subject to a duty of 25 per cent. ad valorem. The vessel repaired or re-equipped must, however, have returned to Canadian waters within a year of the time at which the work was done. All vessel repairs done in other than Canadian yards or works are dutiable, but in cases where they have been done to secure the safety of a vessel and to enable it to reach port the duty may be refunded by order of the Minister. It is to be added that the duty, as is the rule in Canada, went into effect at the moment of announcement, and the fact that the legislation establishing it is not yet complete in no way bars the Government from collecting it.

The shipbuilders were looking for this aid to their industry, and some of them were sanguine that the Government would also give them the benefit of a tonnage bounty. Evidently the latter was farther than the Government could see its way to go at the present time. Besides providing this duty on repairs the Government has introduced legislation for continuing on more favorable terms its assistance to the builders and operators of dry docks. The two concessions taken together should turn the balance of the Canadian vessel repair business into the hands of the domestic shipbuilders. The building of new vessels for the Canadian shipping trade will, however, be as much as ever open to external competition.

Of the amendments to facilitate and make more certain the collecting of the customs duties one provides for the production of way bills in transit and the other gives customs officials the right of free transportation on Canadian trains and vessels in Canadian waters. The former of these is the more important. It requires that the conductor of every railroad train carrying freight to any customs port in Canada from any foreign point shall at the time of making his report produce way bills of all goods on his train.

There has been much complaint of late as to the working of the anti-dumping clause of the tariff. It is contended that this arrangement is proving less effective as a check upon the "slaughtering" evil than it was earlier in its history. Apparently, more ingenuity is shown on the part of exporters to Canada, for it does not appear that the Department or its officials are less energetic to enforce the law.

C. A. C. J.

Repairs are being made to plants of the Southern Steel Company, preparatory to a resumption of operations.

The Chemist in the Iron Trade.

The Chemical Engineer and the Analytical Chemist.

BY GEORGE AUCHY.

The term chemical engineer is given by the writer a very wide significance, being used to designate one who is, or who aspires to be, a manager, superintendent or director, not only in the making of chemicals but in any line of industry whatever, and who has a groundwork of chemical knowledge to start with.

The object of this paper is to call the attention of the iron trade to certain facts connected with analytical chemistry and with chemical engineering, and also to criticise our colleges for the methods and scope of the training they have so far been giving in these lines.

What the Works Ask For and What They Get.

Taking a particular instance, the writer respectfully makes the charge that our colleges have not been meeting, intelligently and fairly, the demands that the iron and steel trade has made on them. The works have asked for analytical chemists simply, and have been given chemical engineers instead, who, it is true, are analytical chemists also, but only in a perfunctory and superficial way, and whose highest ambition is to get out of analytical chemistry as soon as they possibly can. This condition of things is undesirable and the remedy that is obviously to be proposed is simply that colleges make a sharp distinction between chemical engineers and analytical chemists, and a sharp distinction in their respective courses of study, giving the analytical chemist no "engineering," and giving the chemical engineer no analytical chemistry, and starting the latter with the steel works office instead of with the steel works laboratory, as now. For the analytical chemist, it is necessary that the college course be cheap, comparable in this respect with a course in stenography, or an ordinary business course. Such a cheap and brief course would be no innovation. Our colleges today all give special courses in chemistry to whomsoever desire them.

Neither Party Gets What He Wants.

Although the demand for analytical chemists from the steel trade has been a great and growing one, yet probably in no other business do demand and supply connect with each other in such ridiculously loose and disjointed fashion as here. Neither party to the transaction gets what he wants or what he is entitled to have. The employer gets a whale instead of the minnow he is fishing for, and the chemical engineer just the reverse, instead of the dignified and well paid position that his long and expensive course at college entitles him to expect. The chemical engineer gets routine laboratory work in impossible amount, and at mechanic's wages, and with the hoped for "chance of advancement" year by year receding further into the dim and misty depths of doubt and uncertainty. And moreover, there is at best an element of economic waste about the whole performance that is entirely out of harmony with the utilitarian spirit of the age.

Supposing that the college graduate in chemistry succeeds ultimately in developing into a full-fledged chemical engineer, and gets the coveted post of steel works or furnace manager. In that event, his knowledge of general chemistry will be of the greatest help to him, but the years in college and at the works spent on analytical chemistry will have been years entirely wasted as far as any help or advantage to him in his final occupation is concerned. He might just as well have spent those years in the study and practice of dentistry or any other business entirely unconnected with the iron and steel trade.

The Steel Business Not Learned in the Laboratory.

At the same time, from the standpoint of the employer's interests, there is to be considered the waste involved in the appointment of a man who has his business all to learn after the appointment, or who, if he has learned anything of it before the appointment, has

done so at the expense of the other work then engaged in. The analytical chemist can not learn the steel business in the laboratory. The office man, on the contrary, if not of the humblest type, learns the steel business almost with every breath he draws. The same is true of the man outside the office in the works. In fact, of all places about the works, the laboratory is really the only place where nothing whatever about the steel business can be learned. In this particular it is unique and stands quite alone, and the wastefulness therefore of making a practical steel man out of the analytical chemist method of producing roast pork.

It is true that the steel works manager should be a chemical engineer, or at least should understand the chemistry of the metallurgical processes under his charge. It is true also that the steel works chemist understands the chemistry of these processes (but it must be borne in mind he understands this entirely because he has studied general chemistry, and not in the least because he has studied analytical chemistry), but the waste involved in transforming the chemist into the manager is not the less plain. It is a performance that irresistibly reminds us of the alleged ancient Chinese method producing roast pork.

According to Charles Lamb, roast pork was unknown in China until one time a pig-sty accidentally took fire and burnt down, and the unfortunate owner incautiously touching the still hot carcass of a pig burnt his finger, and, hastily thrusting the injured member into his mouth to alleviate the pain, got the taste of roast pork and found that it was good. The news quickly spread, and pig-sty fires became soon a regular and frequent occurrence, and it was a long time before they realized that this was a crude and expensive way of getting roast pork. But in their main facts the ancient Chinese were undoubtedly right. Just as today, in the steel trade, it is undoubtedly true that a chemical engineer as a steel works manager is the right man in the right place. What must be criticised only is his devious, wasteful and uncertain way of getting there. Perhaps also on the ground of candor the tortuousness of his path to the steel work's superintendency is not strictly to be commended.

When an Analytical Chemist Is Wanted, That Is All.

But here exceptions may be perhaps taken by some to the writer's dictum that the iron and steel trade's demand for chemists is a demand strictly and exclusively for analytical chemists and not at all for chemical engineers or for chemical engineers and analytical chemists mixed. Without professing infallibility on this point, and with the fullest realization that he may be mistaken, the writer must nevertheless believe from his experience and observation that when the iron and steel trade asks for an analytical chemist, an analytical chemist is all that is wanted, and there is no ulterior aim whatever. Just as a blacksmith is employed to do blacksmithing simply, and an office man to do office work, so a chemist is employed to do analytical work simply, and in no case, or at least in very few cases, the writer believes, is there also present in the employer's mind a determination to by and by make a practical steel man of his chemist.

There was a time, perhaps, in the very start, when the employer expected something more of the chemist than analytical chemistry, but this was merely because the employer was not aware either of the tediousness and laboriousness of analytical work or of the extent of his own demand for it, and was afraid that he could not keep his chemist busy with analytical work alone. But this fear has been dissipated, and the problem of iron and steel works today is how to turn out the analytical work required. The demand therefore for analytical chemists is a constantly growing one.

No Demand for the Chemical Engineer.

For chemical engineers, on the contrary, there has never been any demand from the iron and steel trade. The chemical engineer approaching here for a position finds no broad flower-skirted avenue leading to the works and terminating in a wide open gateway with the inscription in great golden letters, "Welcome Chemical

Engineer!" On the contrary, not only does he find no special entrance for himself, but he finds, moreover, all other entrances barred to him, except he assumes a humble disguise. Naturally enough the disguise he assumes is that of analytical chemist. Really it is no disguise.

He is in fact, and truly, an analytical chemist. But this is exactly what is to be deplored. He ought not to be an analytical chemist if he is a chemical engineer. Or, if he is really an analytical chemist, he should not be a chemical engineer. For, if he is both he is probably not much of either. As a matter of fact, he is usually a good bit more of a chemical engineer than an analytical chemist.

We do not have to scratch the ordinary steel works or blast furnace chemist very deep to find the chemical engineer. This is all wrong. Analytical chemistry, though far below chemical engineering in dignity and importance, is nevertheless too exacting a mistress to be taken up and contemptuously discarded at will. So, too, on the other hand, chemical engineering is too important and too absorbing a profession to be diluted with 10, 15, or 20 years of study and work in some extraneous and entirely irrelevant pursuit. What, for instance, would be thought of an iron and steel chemical engineer who with deliberate intent spent 10 or 20 years at dentistry as a preliminary to steel work's superintendency? Yet to the full-fledged iron and steel chemical engineer—that is, the blast furnace manager or steel works manager—20 years of preliminary work at dentistry would be just as valuable a training to him as 20 years at analytical chemistry.

The Future Iron and Steel Chemical Engineer.

Here let us reiterate that the chemical knowledge so useful to the iron and steel manager is a knowledge derived from the study of general chemistry, and not at all from the study of analytical chemistry, and the steel works or blast furnace manager in remembering how to make an analysis remembers nothing that is directly or indirectly of any value to him, as a manager or chemical engineer. To hazard a prediction, the iron and steel chemical engineer of the future will be a good bit more of a chemical engineer than his brother of today, and will not be an analytical chemist at all.

Young men choosing this profession should clearly understand that a jump from the work's laboratory to the work's superintendency is only accomplished at the expense of a violent strain on the eternal fitness of things, and it is hardly harshness to characterize the cherishing of such an ambition as a piece of effrontery on their part. This will best be seen by an illustration. Suppose that a man should apply for the position of steel works superintendent, basing his application upon the fact that he had studied chemistry, physics, mathematics, French and German, Biblical geography, analytical chemistry and other things useful to the steel man, and that after all this, to still further qualify himself for the position of steel work's superintendent he had taken a polar trip with Peary, what would be said to him? It would be said that his study of chemistry, &c., was all right, and excellent as far as it went (but that it did not go far enough), but that his trip to the North Pole, though a highly creditable performance in itself, yet viewed as a preliminary to the steel business it could not be considered as anything else than a piece of foolishness, because he could not possibly learn anything about the steel business at the North Pole.

But it is just as true that he could not learn anything about the steel business in the steel works laboratory. That is, of course, if he is conscientious, and steals no time from his work. Or even if he works overtime at learning the steel business, he is nevertheless taking time that belongs to analytical chemistry, time that he needs for his chemical journals and analytical books, or time that he needs to investigate the perplexing practical analytical problems that are always springing up, or that he needs to look to for the detection of error in his methods. The steel works chemist, if he has the love for his work that every worker should have, will have no time to learn the steel business, either in or outside of labora-

tory hours, unless, indeed, he is exceptionally able. Especially is this true if he for his employer's benefit takes up the study of metallography and of theoretical metallurgy in addition to analytical chemistry, and this latter is something that it is well for him to do, because nobody else around the works will do it—at least not systematically and thoroughly.

The Need of Theorists.

Theorists at the works are just as scarce as practical men are plentiful. So that in metallurgical theory the steel works chemist finds a genuine field of usefulness if he desires one outside of, and in addition to, analytical chemistry. But, instead of taking advantage of this opportunity for usefulness, he is hardly settled in his place before he bends all his energies to making a practical steel man of himself, a performance which for absurdity throws the familiar "carrying coal to Newcastle" completely in the shade. It is, indeed, like selling potatoes to get money to buy coal to carry to Newcastle at a time when Newcastle is suffering with a potato famine.

The chemist will find an abundance of practical men at the works who are amply able to hold up their end, and the chemist cannot hope to compete with them on their own ground, or to catch up to them, handicapped as he is with his laboratory duties, and in trying to do so he likely succeeds in merely falling between two stools and becoming a sort of a hybrid nondescript. His ambition to become a practical steel man prevents him from being much of an analytical chemist or metallurgical theorist, and on the other hand his analytical duties prevent him from becoming much of a practical steel man. So, as a result, he is perhaps apt to be not much of anything—neither fish, fowl nor good red herring.

But if the writer is wrong, as well he may be, in believing that this is not what the steel man wants when he employs a chemist; in other words, if it is a fact that the iron and steel trade all along has been expecting chemical engineers in response to its demand for analytical chemists, then of course the writer's charge that the colleges here do not understand their business must be apologetically withdrawn. His guns must then be trained at the iron and steel employers instead, and it is against them then that the accusation must be made that in this particular they do not understand their business, and are like Charles Lamb's ancient Chinese, taking a wasteful, round-about way of accomplishing a simple thing. If the steel man's demand for an analytical chemist is merely a pleasant conceit, and what he really wants is a chemical engineer, then he is taking a very expensive and round-about way of getting him. Let him put his embryo chemical engineer in the office, or let him put him anywhere around the works except in the laboratory. The laboratory is the last place for the young chemical engineer—as well might he go in a grocery store. There is no resemblance or connection between the chemical reactions of metallurgical processes and those of chemical analysis.

The probability is, as before stated, that the iron trade has been calling for analytical chemists simply, and the many cases where the chemist has developed into the manager are cases merely of the buoyancy of genius. That is, these chemists have risen to superintendency because they have had exceptional ability, and not because they have been analytical chemists. As blacksmiths they would have risen just the same. A long list could be given of men who were distinguished as analytical chemists and afterward distinguished as iron and steel metallurgists, but this proves nothing except native ability.

The Weidenthal-Gosliner Electric Works, San Francisco, Cal., which for the past eight years has conducted its business as a copartnership, has recently incorporated with a capital stock of \$100,000. The company has moved into its new building, located at 623 to 625 Mission street, which affords better facilities for the handling of its business, comprising electrical machinery, gas engines, hoists, pumping machinery and general contracting in electrical machinery. S. H. Weidenthal is president, and H. J. Gosliner, vice-president and secretary.

The Latest Results with Steel Rails.*

Investigations by Pennsylvania Railroad Interests.

BY E. F. KENNEY.

In almost any engineering structure an increase in the load and stresses is met by the engineer by an increase in the resistance by means of greater sections and stronger members, but there seems to be very strong opposition to an increase in the amount of metal in the rail. One reason advanced is that rails of lighter weight show less breakage than the heavier rails. The light, flexible rail will relieve itself by bending until it gets support, whereas the heavier rail, being stiffer, will stand up and take the stresses. Under the same drop test blow the 100-lb. rail will break very much oftener than the 70-lb., but the deflection caused by the blow will be much less. In track we can keep better line and surface with the 100-lb. rail than with the lighter rail, but in doing this we put more work on the rail and less on the other elements of the track. As the average cost of rail on American railroads is only about 7 per cent. of the total maintenance charges, and as it is well known that the cost of maintaining track laid with 100-lb. rails is decidedly less than for that laid with 85 or 70 lb., it seems quite probable that the adoption of much heavier rail sections than those used to-day would be distinctly an economy because of the reduction of the cost of maintaining the track. Aside from economy, it would unquestionably be an advance on the side of safety.

Deep Headed Rails Stand Service Best.

Now, over 90 per cent. of the rails which fail do not fail as girders, but in their details. Regarding the split head, which is the type of failure probably causing more trouble than all the others combined, the following figures have been furnished by railroads with heavy traffic, A having the heaviest tonnage in the country. A uses a deep headed rail, while B and C use a shallow headed rail. The number of 100-lb. rails removed from track in one year per 1000 tons rolled is 0.66 for road A and 12.59 for C. The number of 85-lb. rails removed from track in one year per 1000 tons rolled is 0.59 for A, 6.02 for B and 8.08 for C. The percentage of failures was 10 to 20 times as great for B and C as for A, and of these failures on the last named roads 90 per cent. were in the head—namely, splitting, often spoken of as piping—while this type of failure was almost unknown on road A with the deep headed rail. The necessary stiffness should be provided not by spreading the metal out so thin as to weaken the head and base of the rail, but by the addition of enough metal to furnish the required girder strength without weakening the section in its details.

Rolling Temperature.

New sections have been designed increasing the size of the base, making it possible to roll the entire rail at a more uniform temperature, but unfortunately robbing the head of some of its metal. However, the rolling of these rails so far has indicated that the structure of the metal in the head is much finer than in the old section and should give better results in track. None of these rails are yet in service. It was expected that for these new sections the shrinkage allowance could be reduced, but this is not so. It was the thin flange that determined the shrinkage of the old rails. In going through the cambering wheels the head was stretched, giving the hot head a greater length for shrinkage than the base. In rolling the new section the temperature is nearly uniform and much colder than the head of the old rail was, but no part of the new rails is as cold as the thin base of the old, consequently a greater shrinkage allowance is required.

Open Hearth Steel.

A great deal is heard of open hearth rails, and many persons seem to be impressed with the belief that the

words open hearth are a talisman which will cure all their troubles. Some rails which were made in open hearth furnaces have given excellent service and others gave anything but good results. The writer some years ago suggested the use of very high carbon rails and advocated keeping the phosphorus as low as possible, so that the carbon could be kept very high. In accordance with this the Pennsylvania Railroad made a trial lot of rails 0.80 to 0.90 carbon and less than 0.02 phosphorus, the phosphorus actually being 0.009 and 0.011. These rails gave excellent service, not because they were open hearth rails, but because the low phosphorus permitted us to use enough carbon to make them wear well. It is impossible to use this per cent. of carbon in open hearth steel much higher in phosphorus, and open hearth steel much lower in carbon will not give the wear shown by these rails. On the strength of the behavior of these rails 3000 tons were ordered 0.80 to 0.90 carbon and less than 0.03 phosphorus, and we then had an exhibition of some of the difficulties to be encountered with open hearth steel.

In the converter it was easy to control the carbon content and hold it within narrow limits so that the 10 points of allowable variation were quite sufficient, but the open hearth furnace cannot be controlled in the same way, and in making the 3000 tons the heats varied in carbon nearer 20 points than 10. It thus ran about 0.75 to 0.95, and as the amount of segregation of carbon increased with the carbon content some of the steel was so brittle that it had to be rejected, and even at that some brittle rails got into track. The rails as a whole gave very good results in track, but it was their exceptional composition, not the mere fact of being made in the open hearth furnace which was responsible. This was clearly shown in the behavior of some open hearth rails of 0.06 phosphorus, in which we did not dare to run the carbon very high and which in track did not wear as well as ordinary Bessemer. Unless we are able to get an exceedingly low phosphorus content in the basic open hearth we had better hold to the acid Bessemer.

[The paper then took up the occurrence of seams in rail steel. These have been found in all the steels investigated at Watertown Arsenal, from expensive gun forgings down to the cheapest steel. Mr. Kenney thought that as these minute seams are likely to be present they are a strong argument for sufficient metal in the rail to compensate for the lack of continuity. The statement that all crescent shaped breaks in rail bases are caused by seams is too sweeping. In addition to these seams some rails show distinct stripes of ferrite or pure iron on the surface, usually with threads of manganese sulphide running through them. It has been suggested that the ferrite streaks are caused by manganese sulphide throwing carbon out of solution, but this the writer thought improbable, since manganese sulphide exists in the interior of the rail without the production of ferrite there. He thought the patches of scale adhering to parts of the ingot mold might cause the ferrite streaks, by causing a lag in the cooling effect in the portions of the ingot just underneath the patches.]

Discard According to Piping.

In cropping the blooms at the shears it is often impossible to tell when the piped portion has been entirely removed, and for a number of years the feeling has been growing that to guard against piping a heavy discard should be made from the top of the ingot. The writer was in favor of this and advocated a discard of 25 per cent., believing that this was the only way to insure the removal of all the metal containing these internal defects. The objection to this was the waste. Of all the rails put in track by the Pennsylvania Railroad only about one-fortieth of 1 per cent. failed in any year. Assuming the average life at 8 years this would be one-fifth of 1 per cent., so that in discarding 25 per cent. we would be discarding 24 4-5 per cent. of metal for the sake of detecting one-fifth of 1 per cent. A test has been devised which makes this waste unnecessary, as the same result is obtained by the method of procedure advocated by the Pennsylvania Railroad and the American Railway Association and incorporated in the specifications which have been recently adopted by them. The crop end from the

* From a paper read at the meeting of the American Society for Testing Materials, Atlantic City, N. J., June 24, 1908. Mr. Kenney was for some years engineer of tests of the Pennsylvania Railroad. He is now metallurgical engineer of the Cambria Steel Company, Johnstown, Pa.

top of every ingot is tested to destruction, and if piping is shown all the top rails from that heat are rejected. This practically means that about 30 per cent. will be discarded from all heats which show piping, while those which do not show piping are cropped only the usual amount.

The Cambria Steel Company has rolled a considerable tonnage of rails under these specifications and the testing to destruction unquestionably detected the pipes. To find to what depth the pipes extended we polished the end of the drop test pieces and cut the top rail adjoining the test piece into small lengths, examining carefully each cut for pipes. It was found that of the heats showing pipes in the drop test piece when tested to destruction 60 per cent. contained pipes so short that they were confined entirely to the crop end. Of the remaining 40 per cent. which extended into the top rail

40 per cent. showed pipe extending more than 1 ft. but less than 4 ft.
26 per cent. showed pipe extending more than 4 ft. but less than 7 ft.
20 per cent. showed pipe extending more than 7 ft. but less than 10 ft.
16 per cent. showed pipe extending more than 10 ft. but less than 13 ft.
16 per cent. showed pipe extending more than 13 ft. but less than 16 ft.
10 per cent. showed pipe extending more than 16 ft. but less than 19 ft.
10 per cent. showed pipe extending more than 19 ft. but less than 22 ft.
10 per cent. showed pipe extending more than 22 ft. but less than 25 ft.
8 per cent. showed pipe extending more than 25 ft. but less than 28 ft.
6 extended all the way through (very slight).

It will be seen that even under this specification the rejections include the 60 per cent. of rails which contain no pipes. It would be quite feasible and legitimate to avoid this by the acceptance of all heats in which the pipe can be shown to be confined to the crop end. This can be determined by roughly polishing the end of the drop test piece.

The Drop Test.

Changing conditions have been so modifying the effect of the drop test that there is a question whether as we are applying it, it is a proper one. A 100-lb. rail will not stand as heavy a drop test as a 70-lb. rail of the same steel because it is stiffer; and as the heavy traffic has necessitated harder steel with higher carbon, to get better wear we are in the position to-day, with our stiffer sections and harder steel, where the drop test is causing the rejection of the very kind of steel we need in track. In a recent series of tests made on pieces cut from the same rail, some of which were subjected to 15-ft. fall and some to 19-ft. fall, in almost every case where a rail stood the 15-ft. fall but broke under the 19-ft. fall the steel showed plainly by its fracture that it was not brittle, but simply hard steel which could not extend as fast as it is necessary for the extension flange to extend to avoid fracture.

The amount of fall required to strain the rail beyond its elastic limit and produce a permanent set has been found to be about 12 in. for 100-lb. and 8 in. for 85-lb. rail. It is comparatively seldom that a rail is actually bent by the shock in service, and yet we demand a test about 20 times as great in momentum and more than 20 times as great, so far as the effect on the rail is concerned, as it is probable that the breakage under the drop is due really more to the speed of the tup than to the momentum. In other words, a test using a much heavier tup and a smaller drop might be fairer to the rail and more nearly approach the service conditions. Moreover the drop test is simply a test of girder strength, and, as pointed out earlier, 90 per cent. of rail failures are not failures as girders but failures in the details.

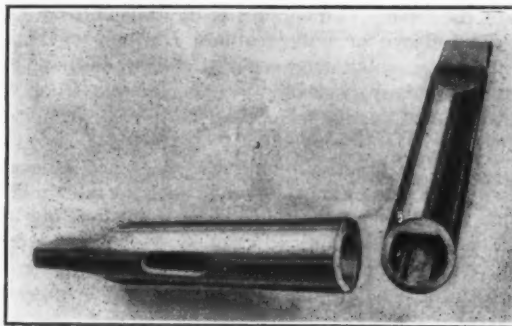
We have many instances of steel which will bend under slowly applied stresses in such a way as to give the impression of extreme ductility, but which under suddenly applied loads is very brittle and will not stand any amount of distortion. Some impact test is necessary to detect this condition, but it should be a reasonable test, one which differentiates between a strong, hard steel and a brittle softer one.

To show the different results obtained by using differ-

ent anvils we took pieces from the same rail and subjected them to the same height of fall of a 2000-lb. tup in the new machine at Sparrows Point, in the axle testing machine at Cambria and the rail testing machine at Cambria. The Sparrows Point machine has a 20,000-lb. anvil on concrete, the axle machine at Cambria has an anvil of 17,500 lb. supported on springs and the old Cambria rail drop test has about 3000-lb. anvil. Taking the deflections obtained at Sparrows Point as unity, those obtained in the axle machine were 97.6 per cent. and those in the Cambria rail machine were 75.3 per cent. The manufacturers have recently adopted a standard testing machine having a 20,000-lb. anvil supported on springs. This will eliminate the variation due to weight of anvil and character of foundation.

A Special Drill Socket.

A drill socket, appropriately named the Use-Em-Up, being designed to hold drills with broken tangs, has been brought out by the American Specialty Company, Harvey, Ill. This socket differs from the ordinary Morse standard only in having a flattened side on its interior tapered surface, as shown in the accompanying illustration; and in the longer drift slot provided to facilitate the driving out of tangless drills. To prepare a drill shank to fit



The Use-Em-Up Drill Socket Made by the American Specialty Company, Harvey, Ill.

this socket it is ground with a corresponding flat; a few minutes' work thus makes an otherwise worthless drill serviceable. The hold afforded by this device is positive and effective on both large and small drills, and is especially advantageous in high speed work. The socket is finished in one solid piece, the interior being flattened by swaging on a forming tool; the stud is turned in a lathe and the socket finished in the same manner as standard sockets. The widths of the flat face on the interior of different sized sockets are as follows: For No. 1, 5-16; No. 2, 7-16; No. 3, 9-16, and No. 4, 11-16 in.

A Large Flanging Press.—The Petroleum Iron Works Company, Sharon, Pa., is installing in its plant a 200-ton sectional flanging press, built by R. D. Wood & Co., Philadelphia, which will operate under 1500 lb. hydraulic pressure. It has a 60-in. gap, 8 ft. 6 in. x 6 ft. table, and is equipped with two vertical rams, each of 100 tons capacity, having 30-in. stroke, which can be operated together or independently, to suit the work, also one horizontal ram of 50 tons capacity and 24-in. stroke, and one 75-ton supplementary ram with 24-in. stroke. This machine or straight flanging will bend plate up to and including 1¼ in. cold, or will dish and flange 84-in. diameter heads in one operation. The machine can also flange 45-in. flue holes in ¾-in. boiler heads, and turn straight or O G flange at end of riveted pipe or any rectangular or circular shell. It can also bend angles or shapes to any desired forms, besides turning out all classes of flanged work. The machine will shortly be placed in operation.

The Portsmouth Steel Company, which operates plate and jobbing mills at Portsmouth, Ohio, is now manufacturing a full line of Economy tie plates, not "tin" plates, as erroneously printed last week. The Spencer-Otis Company, Chicago, Ill., has the exclusive selling agency for this product.

The American 2-Ft. High-Speed Radial Drill.

As a substitute for a larger radial drill on work which requires a powerful machine but not a very large swing the American Tool Works Company, Cincinnati, Ohio, has developed the 2-ft. back geared high speed radial drill shown in the accompanying illustrations. In proportion to its size it has a remarkable producing capacity. Probably it is the only 2-ft. radial drill built in this country having such power and rigidity, as can be judged by a reference to the tests which are later referred to. The drill is the smallest of a full line, including 2½, 3, 3½, 4, 5, 6 and 7 ft. radial drills, which are designed to operate under the speeds and feeds possible with high speed steel twist drills. The machines are especially designed for rapid drilling and heavy tapping, and are built with either cone pulleys or speed box drive. The latter is shown in the illustration. This particular machine drills to the center of a circle of 4 ft. 5 in., has a greatest distance from the spindle to the base of 3 ft. 9½ in., a spindle traverse of 11 in. and a traverse of the head on the arm of 16 in.

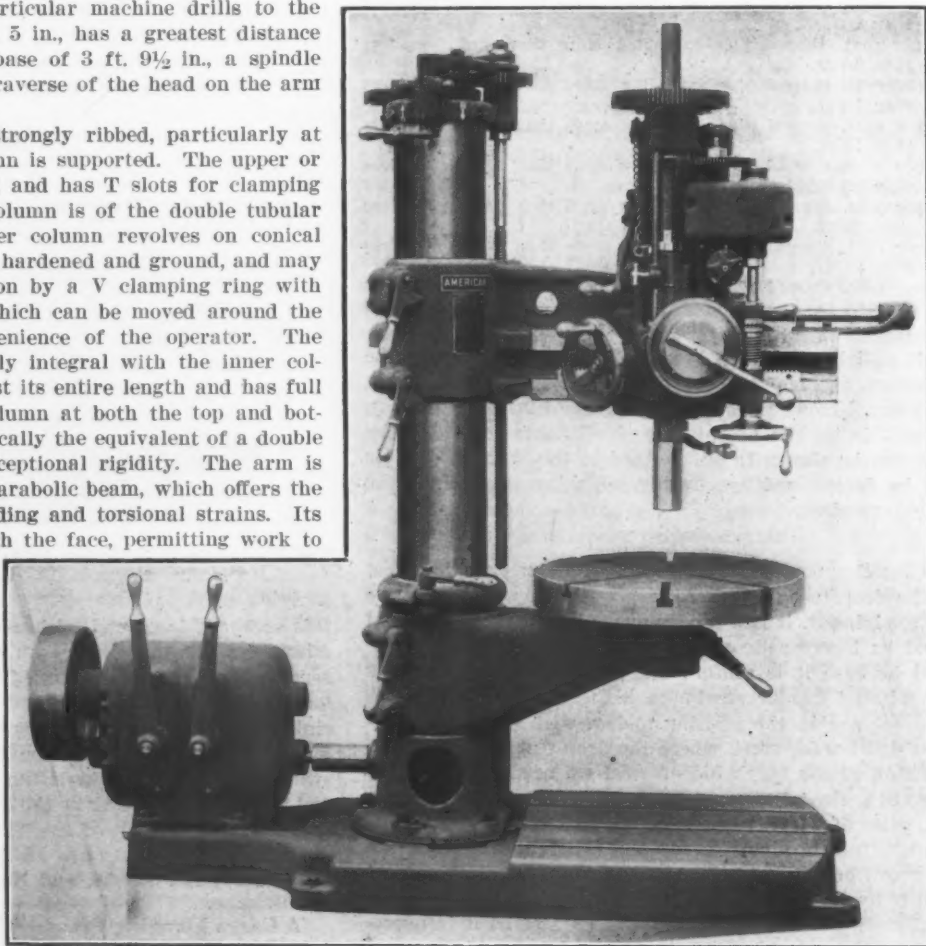
The massive base is strongly ribbed, particularly at the point where the column is supported. The upper or working surface is planed and has T slots for clamping work to the base. The column is of the double tubular type. The sleeve or outer column revolves on conical roller bearings, which are hardened and ground, and may be clamped in any position by a V clamping ring with attached binder handle which can be moved around the column to suit the convenience of the operator. The outer column is practically integral with the inner column, which extends almost its entire length and has full bearings for the outer column at both the top and bottom. There is thus practically the equivalent of a double column, which affords exceptional rigidity. The arm is in the form of a hollow parabolic beam, which offers the greatest resistance to bending and torsional strains. Its lower edge is parallel with the face, permitting work to be operated upon close to the column, so as not to necessitate an extreme reach of the spindle when the head is in such a position. The arm is clamped to the column by two binder levers, and, in fact, no loose wrenches are required on any part of the machine. The arm is provided with a gibbed screw, which permits it to work freely without sagging while the binder handles are loose. The arm is raised and lowered rapidly by a double thread coarse pitch screw, the operation of which is controlled by a lever near the top of the column. Arrows at each extreme of the movement of this lever indicate the direction of travel which the arm will take when the lever is thrown to the corresponding sides.

The machine may be driven by single belt when provided with a speed box or by a motor of any type, either through gears, chain or belt. The gear connected motor seems to be the most satisfactory from the company's experience. The speed box is very powerful, of the geared friction type, and provides four changes of speed, each instantly available by manipulating the two levers shown. The frictions are claimed to be extremely powerful, and since there are few parts in their construction they can be made large to avoid slipping under severe duty, and the use of loose delicate parts. There is declared to be no shock to the parts when throwing in any speed.

The head is moved along the column by a hand wheel through an angular rack and spiral rack pinion. For

locking the head in any position a convenient clamping device is provided. The back gears are located on the head, bringing the greatest speed reduction direct to the spindle. A convenient lever manipulates these, engaging or disengaging them without shock while the machine is in operation, the high speed being run through a friction. On the head is the feeding mechanism, which provides four rates of feed in geometrical progression from 0.007 to 0.02 in. By turning a knob on the feed box these feeds are obtained, and a dial with reference to a fixed pointer indicates which one is in action. It is not necessary to refer to index plates and then operate other levers. The all gear feeds when supplied instead of belted feeds insure greatly increased producing capacity, rapidity of change and positive action. The feeds operate through a friction which permits crowding the drill to its limit without straining the feed works.

Sixteen changes of speed are provided for the spindle,



The 2-Ft. Back-Geared High Speed Radial Drill Built by the American Tool Works Company, Cincinnati, Ohio.

ranging from 33 to 400 rev. per min., and all immediately available without stopping the machine. The speeds cover a wide range and vary by small increments, which, combined with the powerful drive, adapt the machine for efficient use with ordinary or high speed twist drills of large sizes. A speed plate on the column indicates to the operator how to select the proper speeds for both carbon and high speed drills for either boring or tapping. The spindle is counterbalanced and has a quick advance and return through a friction connection. The feeds can be automatically tripped at any position of the spindle by an adjustable dog and pointer acting on the worm clutch. On the spindle are depth graduations which can be read from zero. A safety stop acts automatically at the full depth of the spindle preventing breaking of the feeding mechanism.

The tapping mechanism is carried on the head between the back gears and speed box thus giving to the already powerful frictions the benefit of the back gear ratios. This makes unusually heavy tapping operations possible, and also permits taps to be backed out at an

accelerated speed. A lever for starting, stopping or reversing the spindle is controlled at the head from the front of the machine.

The following tables are interesting as showing something of the capacity of the machine:

Table I.—Drilling Test in Cast Iron 2 In. Thick.

Drill size, inches.	Speeds.		Feeds, inches.		Back gears.		Actual hp.
	Rev. per min.	Cutting speed, feet per min.	Per rev.	Per min.	Ratio.	Position.	
3/4.....	290	56.9	0.015	4.35	1.5	Top.	3.68
3/4.....	406	79.7	0.020	8.12	1.5	Top.	7.40
1 1/32.....	290	83	0.020	5.8	1.5	Top.	7.40
1 1/32.....	406	116.2	0.020	8.12	1.5	Top.	11.1
1 1/16.....	290	111.4	0.015	4.35	1.5	Top.	10.5
1 1/16.....	290	111.4	0.020	5.8	1.5	Top.	13.5
1 1/8.....	207	79.5	0.007	1.4	1.5	Top.	6.5
1 1/8.....	207	79.5	0.020	4.14	1.5	Top.	13.5

Table II.—Drilling Test in Steel 3 In. Thick.

Drill size, inches.	Speeds.		Feeds, inches.		Back gears.		Actual hp.
	Rev. per min.	Cutting speed, feet per min.	Per rev.	Per min.	Ratio.	Position.	
3/4.....	406	79.7	0.007	2.84	1.5	Top.	5.01
3/4.....	406	79.7	0.011	4.46	1.5	Top.	11.8
3/4.....	290	56.9	0.020	5.8	1.5	Top.	5.01
1 1/32.....	290	78.3	0.011	3.2	1.5	Top.	5.9
1 1/32.....	106.5	47.9	0.011	1.17	5.72	Bottom.	8.4
1 1/16.....	76	36.6	0.011	0.84	5.72	Bottom.	5.3
1 1/16.....	76	36.6	0.015	1.14	5.72	Bottom.	6.2
1 1/8.....	76	36.6	0.020	1.52	5.72	Bottom.	8.4

Table III.—Tapping Test with Pipe Taps in Cast Steel 1 1/2 In. Thick.

Diameter tap, inches.	Speeds.		Feeds, in.		Back gears.		Actual hp.
	Rev. per min.	Cutting speed, feet per min.	Per rev.	Per min.	Ratio.	Position.	
2 1/2.....	38.5	28.9	1/4	4.8	5.72	Bottom.	9.14
3.....	38.5	35.2	1/4	4.8	5.72	Bottom.	9.7
Test in Cast Iron 1 1/2 In. Thick.							
2.....	40	24.8	1/11.5	3.4	5.72	Bottom.	4.24
2 1/2.....	40	30.1	1/4	5	5.72	Bottom.	5.15
3.....	40	36.6	1/4	5	5.72	Bottom.	5.75

The machine is regularly equipped with a round table, a double friction countershaft, and a cone pulley drive. The speed box or electric motor drive are provided when so ordered. The round table, which is regularly furnished, has a top surface of 24 in. in diameter and liberal T-slots. It is supported on a rigid knee, which can be swung to either side when working on the base. The lubrication, as is necessary in any machine tool that is capable of high speeds and feeds, has been given special consideration in the design of this radial drill. Every bearing is thoroughly and carefully provided for.

A New Wellston Furnace.—The Wellston Steel & Iron Company is preparing to rebuild its No. 2 blast furnace at Wellston, Ohio, which collapsed June 1, when in blast. The shell of this furnace was put up in 1874, of very thin iron, and had rusted completely out. The wreck was complete, but no damage was done except to the shell itself. The furnace had been in blast two years and the lining was found as good as when put in. It had been the plan to tear down the stack as soon as the lining should give out. It is the intention to replace the iron stoves with brick stoves, and in other respects to modernize the plant. The company's No. 1 furnace, adjoining No. 2, is lined up ready for blowing in, but the date has not been fixed yet.

The steel superstructure of the Blackwell's Island Bridge is now complete, and the contractor, the Pennsylvania Steel Company, has handed over its care to the Bridge Department of New York City. It was begun in October, 1904, and was to have been completed by January 1, 1907, but strikes and other disturbances made it necessary to ask for an extension of time. There remain to be finished the paving of the roads, the laying of rails, and the provision of proper approaches.

The Thomas Brace Rail Company, with offices at 115 Broadway, New York, has been incorporated with an authorized capital of \$2,000,000 to manufacture rails and railroad appliances. The company is also authorized to manufacture motors, cars, structural iron, &c. It is

stated that the company's product will probably be made abroad and no plant will be erected in this country at present. E. T. Thomas is at the head of the enterprise.

The Limitation in the Hepburn Law.

Levy Mayer of Chicago, general counsel for the Illinois Manufacturers' Association, has written an opinion on the two-year "statute of limitation" in the Hepburn law at the request of O. F. Bell, traffic manager of the Crane Company. Mr. Mayer, after an exhaustive review of the case, arrives at the conclusion that was presented in *The Iron Age* of May 7, that the limitation in the law applies only in cases where a shipper has paid a rate that was technically a lawful, published rate; and that it does not bar claims where the shipper has paid more than the legal rate. Where a legal tariff rate has been paid, which the shipper believes to be unjust or unreasonable, a claim for reparation must be filed with the Interstate Commerce Commission within two years.

In reviewing the question Mr. Mayer calls attention to a decision by the United States Supreme Court in the *Texas & Pacific Railway Company v. Abilene Cotton Oil Company*, 204 U. S., 426 (1907), in which it was held that the shipper must first apply to the commission for relief when an unjust or unreasonable rate has been charged. The court said:

A shipper seeking reparation predicated upon the unreasonableness of the established rate must, under the act to regulate commerce, primarily invoke redress through the Interstate Commerce Commission, which body alone is vested with power originally to entertain proceedings for the alteration of an established schedule, because the rates fixed therein are unreasonable.

Mr. Mayer states in his opinion that the two-year limitation does not apply to loss or damage claims, nor to claims for overcharges above the lawfully published rates and charges for the route over which the shipment moves. On the question of misrouted shipments Mr. Mayer quotes Rule 70 of Tariff Circular 15-A, which authorizes the carriers to settle these cases without action by the commission on all shipments that have moved since March 18, 1907. He calls attention to the fact that no limitation is provided in the rule for claims of this character for misrouting.

The Claims Covered by the Law.

After quoting at length from the rules of the Interstate Commerce Commission, Mr. Mayer says:

I am of the opinion that the effect of Section 16 of the interstate commerce act, and of Rule 81 in I. C. C. Tariff Circular No. 15-A, is that claims against carriers for damages for violations of the act which accrued prior to August 28, 1906, if not presented to the Interstate Commerce Commission before August 29, 1907, are barred by the statute, and that claims for violations of the act accruing after August 28, 1907, must be presented to the commission within two years after they accrue, or they will be barred. But the claims that will thus be barred are only those which require action on the part of the commission and which relate to violations of the act of the character heretofore noted, such as claims on account of unreasonable and unjust charges, discriminations or preferences, or involving refunds from the lawfully published charges for the route over which the shipment moved.

In cases of this character, even if the claims have been taken up with the railroad company and settlement is delayed, the claims must be filed with the commission within two years after they accrue or they will be barred. Of course, in effect this will result in a considerable burden to the Interstate Commerce Commission, but the penalties for violating the interstate commerce act or the Elkins act are so severe that it is the only safe method to pursue. Indeed, it appears from the records of the commission that over 2000 informal reparation orders have already been entered by the commission since the Hepburn act went into effect, August 28, 1906. But I am further of the opinion that the statutory two-year period has no application to claims for loss and damages to shipments, or for delay in transportation, or overcharges above the lawfully published rate applicable to the shipment—or other claims of similar character which require no action on the part of the commission. As to claims for violations of the act which have become barred by the statute, the shipper has no redress.

Mr. Mayer is widely known for his ability to win recognition for his opinions from the courts and other tribunals, and his review of this question has been received with great satisfaction by the shippers interested.

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Passenger Earnings a Railroad Problem.

Comment was made in *The Iron Age* of March 26 on the increasing burden of passenger traffic upon the railroads, by reason of the fact that the load per passenger train had not increased nearly so rapidly as the load per freight train, while the rates charged had not changed greatly. The statistics used were those of the Interstate Commerce Commission, for the fiscal year ended June 30, 1906. Poor's statistics for 1907 have just appeared, these covering in general the fiscal year ended June 30, 1907, but in some cases the year ended December 31, 1907. By using these figures the comparison can be brought up to a later date, while by making some additional computations the increasing burden upon the railroads can be brought out still more clearly.

It would probably surprise the average man to learn that in the 15 years from 1892 to 1907, both of which were prosperous years, the number of freight trains passing a given point had actually decreased by 6.7 per cent., although the tonnage, measured by tons carried one mile, increased 176.2 per cent. In the same 15-year period the number of passenger trains passing a given point increased by 19.6 per cent., while the number of passengers carried one mile increased 107.3 per cent. In the trend thus shown lies the gist of the railroad problem of today. It is not to be supposed that railroad managers do not possess a clear conception of this trend and of its influence in creating the embarrassments they insist they are laboring under, but in their public discussions of their problem they evade the issue which a full acknowledgment of this trend would present.

The following tables give the passenger and freight statistics at intervals of five years. The railroad mileage is given in each case, as in 1897 and 1902 there was a slight difference in the mileage of railroads reporting passenger and freight statistics, respectively.

Passenger Statistics.

	Miles of road.	Passenger miles. (Millions.)	Train miles. (Millions.)	Average number of trains.	Passengers per train.
1892.....	170,607	13,584	324	1,899	41.52
1897.....	180,621	12,495	342	1,896	36.49
1902.....	196,648	19,707	403	2,050	48.87
1907.....	225,227	28,166	512	2,271	55.05

Freight Statistics.

	Miles of road.	Ton miles. (Millions.)	Train miles. (Millions.)	Average number of trains.	Tons per train.
1892.....	170,607	84,413	524	3,070	161.14
1897.....	181,065	97,843	500	2,764	195.56
1902.....	197,381	156,624	508	2,575	308.19
1907.....	225,227	233,138	645	2,866	361.22

In the 15-year period the growth of passenger and freight business has not been very uneven. Measured in passengers carried one mile and tons of freight carried

one mile, passenger business has increased 107.3 per cent., and freight business 176.2 per cent., the increase in freight business being thus measurably greater, although there has been a good increase in each. Average receipts have been as follows:

Average Receipts.

	Per passenger mile. Cents.	Per freight ton-mile. Cents.
1892.....	2.168	0.941
1897.....	2.029	0.797
1902.....	2.012	0.764
1907.....	2.040	0.782

These figures are worthy of careful study. In 15 years the average trainload of freight has more than doubled, increasing from 161 to 361 tons, or 125 per cent., and thereby the railroads have seen their way clear to reduce freight rates, so that the average receipts per ton mile have decreased from 0.941 to 0.782 cent, or 20 per cent. The increased trainload would have permitted a great reduction in the rates charged had there not been increased costs in other directions, chiefly the better equipment and better permanent way required.

In the passenger business, on the other hand, there has been scarcely any increase in the trainload. The average in 1892 was 41.52 passengers per train, this increasing only to 55.05 in 1907, or only 33 per cent. The rate per passenger mile decreased from 2.168 to 2.040 cent, or 6 per cent. With the increased cost of operating the road as a whole and of each passenger train as a unit, it was not justifiable to make any decrease at all, when the number of passengers carried per train increased so slightly.

Thus the railroads have taken care of the great increase in freight business by increasing the load per freight train, while they have taken care of the slightly smaller increase in passenger business chiefly by putting on more passenger trains.

Referring to the two general tables of train mileage statistics just given, it can be seen how the railroads have taken care of the increased business. The number of freight trains has of course increased somewhat, but the total mileage of road has also increased, the net result actually being that the number of freight trains per mile of road has decreased from 3070 trains passing a given point in 1892 to 2866 trains in 1907, a falling off of 6.7 per cent., due to the trains being loaded so much more heavily. With the passenger business this was not done, the number of passenger trains passing a given point increasing from 1899 to 2271, or 19.6 per cent.

The comparison between 1892 and 1907 shows the general trend. The forces have been at work uniformly. The tables presented give the statistics for the intermediate years 1897 and 1902. There are variations, but they are such as were brought about merely by the changes in industrial conditions. The year 1897 was one of poor business, and the passenger business showed a decrease, but the number of passenger trains was unchanged, and the average number of passengers per train showed a decrease. In the freight business, on the other hand, 1897 showed a slight increase, and as the number of freight trains is regulated directly by physical conditions there was a sharp drop in the number, accompanied by the regular increase in the load per train. These vicissitudes do not alter the general trend, as the conditions were working and were merely influenced by industrial conditions. The average freight train load, it will be observed, showed a moderate increase from 1892 to 1897, then a larger increase to 1902, on account of the introduction of all-steel and steel underframed cars, beginning in 1899, while 1907 showed a further increase.

Obviously this general trend is to crowd the freight

trains off the tracks altogether, as the number of passenger trains is steadily increasing, while the number of freight trains is decreasing. Obviously something would have to happen. Ultimately the railroads would be doing a passenger business exclusively, and that at rates which, with the meager patronage per train, do not afford a legitimate profit. The passenger traffic as handled cannot bear the increased proportion of the general expenses which the increased proportionate use of the facilities by passenger trains demands should be allotted.

The railroads have done excellent work in increasing the freight train load so largely in the past 15 years, but the saving thereby effected, while going partly to reduce freight rates and to pay the increased cost of operation due to changed conditions in the handling of freight has gone very largely to pay an increased cost of operation properly chargeable to passenger operations, but which that department could not stand itself.

As a result of legislative efforts to reduce passenger rates there has been much effort at defense on the part of the railroads, but in all such discussions there has been a tendency to assume that the existing conditions created by the railroads in handling the freight and passenger business are necessary and not susceptible of modification; that the solution should lie in increased passenger rates or at any rate in their maintenance. The matter of the number of passenger trains has at best been referred to but vaguely, and the excuse made that "the public demands" the passenger service which is being given. There may be some such demand on the part of the public, but certainly it has not been as plainly expressed as has been the demand for lower passenger rates. The railroads clearly elect to yield to the one demand rather than to the other, and their chief reason for doing so is undoubtedly that they have considered it for their best interest to do so. By giving excellent passenger service they have sought to advertise their securities and their freight business. They have put much faith in the adage that "as a man travels, so will his freight travel." They have nursed the delusion that competition has been eliminated, when it is merely competition in rates which has been eliminated, while the competition in character of service has increased.

The present railroad situation shows how dangerous is this form of competition because it is recondite. The problem will not solve itself. No hope can be entertained that in any reasonable time passenger traffic will become sufficiently dense to permit of largely increased trainloads and consequent reduction in cost. As the exception tests the rule, the case of passenger traffic over the 90 miles between New York and Philadelphia can be cited. There is hourly service, with well filled trains. How long would it be until similar conditions were established on the major part of the 225,000 miles of railroad in the United States?

Receivers' Weights in Pig Iron and Coke Contracts.

The agitation begun in New England and now extended to other parts of the country in the effort to procure an equitable basis of settlement of shortages in shipments of pig iron and coke has resulted in the establishment in not a few cases of receivers' weights as the foundation of the foundries' contracts with pig iron and coke manufacturers. Partly on account of this new condition in the trade in the relations of the seller and the buyer, and partly for reasons that had existed previously, prominent interests have decided to attempt the establishment of legal precedents, either through the Inter-

state Commerce Commission or in the courts, that some certain remedy may be had against the transportation companies in cases where there are flagrant discrepancies between billed weights and those at point of delivery.

Large consumers of coke and pig iron, taking advantage of the buyers' market to dictate terms, have insisted that a change be made in their contracts, so that neither railroads' nor shippers' weights shall prevail, and their recent purchases have been made on that basis. This means that each car shall be weighed, loaded and empty at point of destination, no reliance being put on stenciled tare weights, nor upon weights as previously ascertained at point of shipment. But neither may material be weighed outside of the car, by wagon load. The amount of the bill is the difference between weight of the car loaded and unloaded. Where the customer has railroad scales in his yard, properly tested and attended by a sworn weigher, their weights are accepted. If there is no such convenience the railroads will do the weighing, for a consideration. One road charges \$1.50 a car, conceding the fee if there is a discrepancy of more than 1000 lb. Another company has a fixed charge of 5 cents a ton. These weights are the bases of all payments by the customer. The burden of shortages in shipment is transferred to the middleman or the shipper, and he must fight it out with the transportation companies. Some of the dealers profess the belief that the custom is establishing itself as a permanent factor in the trade, because, though it was inaugurated in a market entirely favorable to the buyer, yet when conditions change, and the seller is in a position to dictate, it will be difficult to take a step backward in liberality.

Naturally, if this is the true aspect of the situation, the dealers will have to bear the expense of shortages, and the aggregate of such losses may be considerable, unless some method is devised to eliminate them. The seller is brought into closer active co-operation with the buyer in acting for a common good. As is well known, the attempt at some fair system of placing responsibility has been made by a conference between representatives of foundrymen's associations, shippers and the transportation companies, but little, if anything, was accomplished, beyond giving the subject additional agitation, because the railroad and steamship people could not see the practicability of changing existing methods.

Hitherto, under an almost invariable rule, the customer has been compelled to accept the billed weights, and the railroads have based their freight charges thereon. It is the established practice that the ovens take the railroads' weight at point of shipment as the basis of billing coke, while the railroads take the furnace weights on shipments of pig iron. There has been small redress for buyers so located that freights must pass over the lines of several transportation companies, even if delivered weights were grossly less than billed weights. Complaints have brought forth the claim by each of the companies handling the freight that any loss must have occurred on some other line. Settlements for losses and proportionate allowances for freights have, therefore, been difficult to obtain, and hence comes the desire of the buyer that his coke and iron be billed on receivers' weights, which rids him not only of losses but of annoyance. The gain to the consumer is the loss to the dealer or shipper. It is he who must look to the transportation companies for indemnity or concession.

The causes of discrepancy have been discussed in detail during the past year. A shortage may result from actual loss in transit, through theft or otherwise, or through an error on the part of an employee of railroad or furnace at point of shipment in weighing or in reading or putting

down the tare weight of car; or the tare weight itself may be wrong. Several cases have been reported in the past month where it was apparent that an actual error had been made by the transportation company in finding the weight of a carload of coke, but the effort to procure a correction has been fruitless. In one typical instance the billed weight of a carload was some 10,000 lb. more than the tare weight of the car as stenciled upon it, as if a car with maximum capacity of 35,000 lb. had been made in the billing to hold 45,000 lb. Yet the railroad which gave the weights asserts that the complaint has been investigated and found groundless so far as that company's lines are concerned.

As already stated, the matter has now come to a point where some tribunal will be asked to pass on test cases and establish precedents to govern the settlement of future disputes of this nature. Probably New England will take the initiative in the litigation, either by association or individual action. The plan is first to go to the Interstate Commerce Commission, asking that body to adjudicate the issue, laying down rules to govern in the future, the contention being that the commission has jurisdiction because the transportation companies have discriminated between like claims, making concessions in some and declining to do so in others. If the commission should decide that it cannot act, then the purpose is to take the question to the courts and carry the case to the point of establishing legal precedents of responsibility which would have important influence in the settlement of future claims.

Trade Combinations in Germany.

The Chamber of Commerce of Berlin, Germany, prints annually a series of elaborate reports, prepared by specialists, relating to commercial, industrial and financial developments. These experts, in the course of their investigations, have collected some data bearing on the great movement in their country toward a methodical elimination or moderation of competition among those engaged in the same line of business.

The Great Variety of Associations.

One report prints a list of associations, combinations and syndicates which the experts regarded as influential. It does not include the syndicates in the mining or other great branches, nor those which have existed for so long a time that they are established. It does include 22 associations which were founded in 1907, among which were the spinners of Saxony and Thuringia; the manufacturers of waists, suits and similar articles; the makers of mantles and cloaks of Germany; the association of wholesale dealers in boys' clothing of Berlin; the wholesale dealers in ladies' dress goods; the association of German straw hat and ladies' felt hat manufacturers; the manufacturers of ladies' hats of Berlin; the association of wholesale dealers in straw hats of Germany; the brass syndicate; the syndicate of rolled and pressed lead products; the association of German wind instruments; the vise syndicate; the association of manufacturers of gas and water fittings; the price association of German book printers and others.

Associations are further mentioned as existing among the manufacturers of silk goods, of velvet and plush manufacturers and of dealers in the latter goods, of wholesale dealers in dress goods, of makers of necktie goods and of neckties, of makers of hat bands, of corset clasps and springs, of wool combers and spinners, of manufacturers and wholesale dealers in rubber balls, of dealers in steel shapes at Berlin, of manufacturers of copper sheets and wire, of German dealers in electrical goods, of envelope makers, of manufacturers of China, of cement mills, of merchants and manufacturers of toys at Sonneberg, of wholesale dealers in mineral waters, and of the Berlin wholesale dealers in coal, coke and briquettes. The partial enumeration indicates how widespread the movement is.

Designed to Benefit Their Members.

All these associations have the common aim to better the position of the individual members by determining the maximum which they will yield to customers. The more the goods sold by manufacturers and dealers are uniform, the more pronounced is the aim to determine prices directly as with the selling syndicates in the metals, coal, bottles and alcohol. The greater are the differences in the quality of the products of different manufacturers, and therefore the greater the differences in prices, the more the agreements must refer to other conditions of sale. These may be less important than the prices, but they, too, are very significant. These are credits, discounts, acceptance of rejected goods, free delivery of samples, arbitration in cases of disagreement, &c. To this class belong the majority of the combinations in the textile and clothing industry, with its wide range of styles.

Agreements as to conditions regularly supplement the fixing of prices. One modification of price combinations is that in which the maximum prices are not directly fixed, but are aimed at only indirectly, by confining competition within geographical boundaries or by pooling the output. Special note should be made of the combination of manufacturers of trademark goods, because it embraces very different articles, all, however, bearing a trademark, from champagne to cosmetics. The aim is to keep up the retail price. A retailer who is shown to have sold a single trademark article at less than the established price has the goods of all members of the combination withdrawn from him.

Organization Becoming More Efficient.

Progress in establishing combination has the effect of inducing a premium for similar organizations in other branches not yet syndicated. The force of example is potent. Experience is developed in organizing combinations which has gradually led to efficient types of organization and has rejected inefficient types. Then, too, there has been direct coercion. Buyers who must promptly pay syndicated manufacturers and dealers have less means for paying for goods in other branches, and keep the sellers in those branches waiting until they also form associations.

On the other hand, the combinations among sellers have aided similar organizations among buyers who have sought to force lower prices and more satisfactory terms in this manner. Thus buyers' associations have been formed among smiths, florists, paper hangers, druggists, &c. The Association of Retailers of the Dry Goods Trade has directed its attention chiefly to more satisfactory methods of buying.

At first these associations were declared to be "excesses," which should not exist, and should be got rid of, if necessary through the intervention of the State. Now the public has grown accustomed to see them extend to wider fields, and to become lasting institutions in consequence of the inherent strength of the organizations. Among those directly affected, the prevailing opinion concerning syndicates in their own particular branch may be summarized as follows: The syndicate to which I belong is for the common good, but the combination formed by those who supply me, or who buy my goods, is hurtful to the community.

Those who cannot see any chance of an association in their own branch have no alternative but to regard all syndicates as injurious to the public. Those who are able to rise above the narrow selfish point of view will judge a syndicate on the basis of whether it uses its power solely for its own purposes or whether it has some consideration for the other links in the economic chain.

The Complaints Against Them.

At the present time complaints against the syndicates are quite widespread, and are frequently justified, the following being conspicuous. So far as the policy with regard to prices is concerned, the old complaint is repeated that many syndicates covering raw materials or semifinished articles render the export of finished goods more difficult by selling cheaper abroad than at home. Complaint is made that syndicates frequently raise and lower prices suddenly and largely, while under the sys-

tem of open competition these changes took place more gradually. By these sudden changes the calculations based on former prices, made by dealers or manufacturers, are upset. These troubles are very serious when the combinations break down, since the prices which had been screwed up artificially are apt to drop very much and old stocks are greatly reduced in value.

A common selling agency for the entire pooled products of the syndicate has the very serious drawback that the buyer often does not get exactly the goods which he needs in his operations, and that sometimes, in order to receive any consideration at all, he must submit to having other brands delivered to him.

Common Terms or Variable Terms.

The objection is made against strict common terms that they force retailers who do not control ample capital to order cautiously, which means that they must pay more than when they ordered large quantities. As the assortment is less extensive, the temptation to buying exerted upon the public is lessened, and both these considerations tend to reduce the consumption. This is particularly noted when an effort is made to enter the sharp competition of the world's markets. Then, too, the more accommodating spirit of foreign sellers sometimes makes it preferable to pay duties and import the goods. The fact is pointed out that the syndicates do not standardize terms in cognate branches. Thus a large retailer reports that in his purchase he deals with 35 different combinations, and must comply with 17 different sets of terms. In France and England the entire textile industry deals under common terms.

Combinations are usually formed among those belonging to the same stage of the process—among manufacturers, wholesalers or retailers, each by itself. Complaint is made that in almost every case the other groups have their vital interests neglected. The assertion is made that relatively minor changes in the syndicate agreement would have rendered it innocuous or even advantageous to them. The latter point of view is regarded as important in order to smooth down the opposition which the syndicate movement has brought out. It is believed that, in forming such pools, all the lines of business involved should be given consideration and their just claims should be met; in other words, that a broader economic policy should take the place of the narrower business point of view.

It remains to be seen which syndicates, whose creation has so greatly developed during a rising tendency, will show vitality when the business is receding; when the hunt for work and for orders which is characteristic of such periods begins.

The American Car & Foundry Company.

The ninth annual report of the American Car & Foundry Company, covering the operations of the year ending April 30, 1908, shows that the income account compared as follows with the previous year:

	1908.	1907.
Total earnings.....	\$10,624,574	\$11,115,087
Rentals, repairs, &c.....	1,663,194	1,768,003
Net.....	\$8,961,380	\$9,347,084
New construction charged off and insurance reserve.....	746,762	1,207,548
Balance available for dividends...	\$8,214,618	\$8,139,536
Preferred dividends.....	2,100,000	2,100,000
Balance.....	\$6,114,618	\$6,039,536
Common dividends.....	1,050,000	600,000
Surplus.....	\$5,064,618	\$5,439,536
Reserved for repairs, maintenance and improvements	1,650,000	.....
Reserved, common dividend.....	600,000	.....
Year surplus.....	\$2,814,618	\$5,439,536
Previous surplus.....	19,552,630	14,113,094
Total surplus.....	\$22,367,248	\$19,552,630

The statement of working capital shows as follows: Original working capital, \$5,633,004; add surplus earnings at April 30, 1908, as above, \$22,367,247; total, \$28,000,252. Deduct cash expenses for new steel car and other plants, additional real estate, amount reserved for payment of

full purchase price of Wilmington plant, and for additions to steel car plants from date of organization to April 30, 1908; and reservation for construction of and additions to steel car plants, \$10,815,537; net working capital, excluding reserves, April 30, 1908, \$17,184,714.

In his report to the stockholders Frederick H. Easton, the president, said that notwithstanding a heavy falling off in the demand of the railroads for new equipment during the fiscal year, the production of the company's plants was 51,532 steel freight cars, 32,063 wooden freight cars, 171 steel passenger cars, 574 wooden passenger cars, 881,423 car wheels, 16,746 tons of cast iron water pipe, 69,698 tons of gray iron castings, 18,251 tons of pig iron, 136,853 tons of bar iron and axles and 4,500,000 ft. of lumber. The gross sales for the year were \$104,319,500. The amount of freight paid to railroads on material received and shipped by the company was \$6,625,000. The average number of men employed was 23,521 and the wages paid during the year were \$15,915,828. Continuing, he says:

"During the year there has been constructed and equipped one new shop at Milton, Pa., for building all-steel tank cars. Practically all other expenditures charged during the year to plant account have been for improvements at the different steel car shops. There has been made a reservation of \$1,500,000 to cover (as circumstances may make advisable) the construction of new or additions to existing steel car plants. There has been set aside also \$1,650,000 for general overhauling, improvements, maintenance, &c., including the installing of labor saving devices and the equipping of plants with such new machinery as may be necessary to enable us to maintain our leadership in the car building industry. The making of these reservations does not necessarily mean that the total amount will be used during the current year, but it seems wise to have money available so that the company, following its policy of constant improvement, may be in a position to take advantage of favorable conditions as they offer, and hence prosecute the work with least expense and with least interference with productive operations.

"The problem of insurance has been made the subject of careful study for some time past, and the result has been reached that it is advisable for the company itself to carry at least a part of the fire risk. To effect this there has been created an insurance reserve, which at the close of the fiscal year amounted to \$1,000,000. In the construction of new shops, brick, steel and other fireproof materials have been used to the largest extent possible, and all repairs and changes in other shops have been designed and made with reference to making them as thoroughly fireproof as possible consistent with the original design; and in line with this, many of them have been equipped with sprinkler systems and other safeguards.

"Conditions recently obtaining in the industrial world have served to emphasize the soundness of the policy to which the company has committed itself—that is, the accumulation of a working capital sufficiently large to enable it to conduct its ordinary operations without strain during times of financial stringency and to have readily available in prosperous times the capital necessary to produce satisfactory returns.

"During the heavy months of the past year the inventories aggregated \$21,000,000, and, with the accounts receivable, necessitated the borrowing of a larger amount of money than is altogether desirable."

The number of car orders on hand at the close of the fiscal year was the smallest in the history of the organization. This was due solely to the general business depression and condition of financial unrest, the first effects of which are always shown in the railroad's retrenchment in the purchase of new equipment and rolling stock.

The general balance sheet as of April 29, 1908, shows: Total assets, \$92,843,392, against \$104,185,495 previous year; accounts and notes receivable, \$17,797,171, against \$18,464,543; cash, \$3,457,562, against \$3,322,309; audit vouchers payable and payrolls, \$4,551,145, against \$22,533,863; profit and loss surplus, \$22,367,248, against \$19,552,630.

The plant of the Seaboard Pipe Foundry Company, at Savannah, Ga., has been put in operation, after an idleness of some months.

Trade Publications.

Reamers.—William J. Smith Company, New Haven, Conn. Booklet. Describes and gives price-lists of the Smith one-lock adjustable reamer consisting of only three parts in addition to the blades, which are the shell, cam bolt and lock nut. The reamer was illustrated in *The Iron Age*, October 3, 1907.

Machine Tools.—Sibley Machine Tool Company, South Bend, Ind. Catalogue No. 50, 6 x 9 in., 36 pages. Devoted to the Sibley & Ware power drills, which are made in 20 to 28 in. sizes, including drills with plain lever feed and combined lever and wheel feed. Motor drive can be had for all the standard sizes and types. Parts for repairs are illustrated and numbered to assist customers in ordering.

Precision Machinery.—Sloan & Chase Mfg. Company, Newark, N. J. Loose leaf catalogue of bulletin Nos. 1 to 10. Bench lathes, rack cutters, gear cutters, pinion cutters, drill presses, tapping machines and other types of specially accurate machine tools are shown, together with a number of special tools and precision machinery attachments.

Roofing.—W. H. Johns-Manville Company. Pamphlet. Devoted to asbestos roofing, which is made in rolls similar to the ordinary roofing. A number of illustrations are given showing buildings where the roofing has been applied.

Concrete Machinery.—Svenson-Sherman Machine Company, Pittsburgh, Pa. Booklet. Pertains to Svenson concrete mixers, which are made in portable form, and which it is claimed mix cement to accurate measure. Illustrations of the machine in use are given, together with testimonial letters.

Tie Plates and Spikes.—Hart Steel Company, Elyria, Ohio. Catalogue, 6 1/4 x 8 1/2 in., 45 pages. Devoted to the McKee plates, which are made in several types and particularly with corrugated tops in a number of designs. Several diagrams give the punching data for a number of different rail bases used by several railroads, to which the company has furnished tie plates, and a section of the book refers to spikes, giving information for ordering the company's product.

Link Belt Chains.—Link Belt Company, Nicetown, Philadelphia, Pa. Catalogue 175, 6 x 9 in., 208 pages. The varied types of link belt chains and attachments made by the company are illustrated and listed. Traction wheels, chain gears and conveying equipment made by the company are also shown, together with price-lists and directions for ordering the company's product.

Pumps and Pumping Engines.—M. T. Davidson Company, 43-53 Keap street, Brooklyn, N. Y. Catalogue, 6 x 9 in., 96 pages. Covers a complete line of pumping equipment, including pumping engines, air pumps, boiler feed pumps, gas works pumps, mining pumps, distilling apparatus, &c. Useful information, such as areas of circles, directions for installing and operating pumps, and tables of friction loss in pipes are given, and illustrations and sectional drawings of the several types of pumps are included.

Engineering Specialties.—D. T. Williams Valve Company, Cincinnati, Ohio. Catalogue, 5 x 7 in., 180 pages. Illustrates and describes various lines of valves, oil cups, steam traps, cocks, &c., made by the company, in addition to some interesting information regarding repacking valves, directions for regrinding, &c. A number of useful tables and other data, such as terms applied to electrical units, receipts for treating steel, cleaning brass, caring for machinery, &c., are given.

Machinery and Machinery Supplies.—Machinists' Supply Company, Chicago and Pittsburgh. Catalogue, 6 1/4 x 9 1/4 in., 813 pages. This volume is bound in cloth and contains an index of 21 pages. The book is copiously illustrated and embraces a complete line of machinists', railroad, mill and mining machinery and supplies.

Corrugated Sheet Steel.—Brown Holsting Machinery Company, Cleveland, Ohio. Catalogue, 6 x 9 in., 36 pages. Devoted to Ferro-Inclave, which is a corrugated sheet steel of special shape used in the construction of fire resisting roofing, siding, flooring, &c., which, after it is secured in place, is filled on both sides with Portland cement. This makes a reinforced concrete construction. The sheets are crimped into dovetailed sections, the corrugations being 1/2 in. deep. Illustrations of construction work in which the steel has been used are given and a number of completed structures are shown. Methods of applying the sheet steel and combining it with the cement are illustrated with the aid of drawings.

Stay Bolts.—Falls Hollow Stay Bolt Company, Cuyahoga Falls, Ohio. Brochure. An interesting little booklet entitled "Stay Bolts; Their Use and Abuse," written by John Hickey, a master mechanic.

Hammer Drills.—Sullivan Machinery Company, Chicago, Ill. Bulletin 60 A. Devoted to the Sullivan hammer drill, which, it is explained, is a comparatively new type of rock drill, similar in a general way to a large pneumatic riveting or chipping hammer. This drill is operated by air, and when the bit is held against the rock it is struck by a piston or hammer, which drives the shaft end of the steel at 1200 or more blows a minute. The drill is rotated by hand. A complete description of

the parts of the machine is given. The drills are made in sizes weighing up to 70 lb., capable of drilling a hole 2 in. in diameter and 96 in. deep.

Asbestos Wood.—H. W. Johns-Manville Company, 100 William street, New York. Catalogue No. 107. A small booklet advocating the substitution of asbestos wood for slate, marble or fiber. This is made principally from asbestos fiber and has the appearance of ordinary wood, although it is much harder and takes a higher polish. It is made in the shape of boards, shingles, &c., and can be used in construction work much the same as wood.

Tubular Boilers, Dryers, Steel Stacks and Steam Pipes.—Coatesville Boiler Works, Coatesville, Pa. Catalogue. Describes principally the Coatesville high duty return tubular boiler, and contains illustrations of steel stacks, cooling towers, storage tanks, &c.

Peat Machinery.—Julius Bordollo, Kingsbridge, N. Y. Catalogue. Devoted principally to machines for peat briquetting made by the A. Heinen Machine Works of Germany, for which Julius Bordollo is the American agent.

Metal Melting and Refining Furnaces.—Hawley Down Draft Furnace Company, Chicago, Ill. Catalogue, 8 1/2 x 10 1/2 in., 80 pages. Particularly treats of Schwartz metal melting and refining furnaces, in which either oil or gas can be used as fuel, and which are built in seven sizes up to furnaces with a 120-in. shell. Numerous illustrations and cross section drawings are given, together with tables governing the melting of metals and giving mixtures for making various combination metals. Some space is given to the Hawley down draft furnaces.

Lathe Mandrels.—W. H. Nicholson & Co., Wilkes-Barre, Pa. Circular. Illustrates a full set of Nicholson expanding lathe mandrels and gives dimensions and prices.

Mining Equipment.—Jeffrey Mfg. Company, Columbus, Ohio. Pamphlet. Shows a number of installations of Jeffrey wire cable hauls, elevators, coal picking tables, belt conveyors and other mining equipment.

Lightning Arresters.—General Electric Company, Schenectady, N. Y. Bulletin 4573. Details benefits to be derived from the use of lightning arresters and shows a graded shunt resistance multigap lightning arrester of new design, and describes low voltage arresters, static dischargers, constant current horn arresters, &c.

Valves.—Schutte & Koerting Company, Philadelphia, Pa. Catalogue S, sections A, B, C and D. Section A shows types of extra heavy hard bronze valves with cross sectional views; section B is devoted to stop, check and emergency valves; section C illustrates a number of stop and throttle valves and special globe valves, and section D describes balanced trip and trip throttle valves and balanced stop and throttle valves, some of which are made in the heaviest known sizes. These sections are all arranged so that they can be added to a loose leaf catalogue.

Flexible Shafting, Drills, Grinders, Foundry Equipment, &c.—Coates Clipper Mfg. Company, Worcester, Mass. Bulletin No. 21. Illustrates, assembled and in sections, the Coates unit link flexible shafting, which was described in *The Iron Age* June 4, 1908. The rest of the book is devoted to drill presses, breast drills, patent multiple grinders and attachments, foundry equipment, radial drills, boring machines, etc., in connection with most of which the flexible transmission is a feature.

Metal Reels, Spools and Beams.—Frank Mossberg Company, Attleboro, Mass. Catalogue. Covers reels and spools for wire manufacturing, and also for the textile industry.

Foundry Equipment.—Whiting Foundry Equipment Company, Harvey, Ill. (Chicago suburb). Booklet, 6 x 9 in., 30 pages, designed especially for distribution as a souvenir at the company's booth in the recent foundrymen's convention held at Toronto, Canada. Owing to the favor with which it was received, a second edition for general distribution has been prepared, covering a complete line of foundry equipment, embracing all the later models and improvements that have been introduced for the perfection of these appliances. Interesting illustrations show the disposition and arrangement of traveling and jib cranes, tumblers, core ovens, pneumatic crane systems and the Moyer tramrail system. The company also publishes a general catalogue in which all these different machines and appliances are more specifically described. This is referred to as the "foundrymen's reference book," for examples of efficiency and economy in foundry equipment developed by experience and tried out under tests of actual service. The company invites special attention to its automatic cupola charging machine operated by compressed air.

Gasoline Engines.—Globe Iron Works Company, Menominee, Wis. Catalogue No. 1006, 8 1/2 x 9 1/4 in. Describes the White gasoline engines in both stationary and portable types, which are described as the "hit and miss" and the "automatic," each operating on the four-cycle principle. The electric ignition system and the arrangement of throttle, air and resistance valves are clearly illustrated in broken view showing the internal mechanism of these parts. A line drawing illustrates the proper setting and connections for the installation

of the engine. Several types of portable outfits for well drilling, pumping and other service are shown in full page engravings. The company, which some years ago was located in Minneapolis, is now represented in that city by W. E. Wines, 6-8-10 Central avenue. Since its establishment in Menominee a large part of its output has been sold in Australia and New Zealand.

Electrical Equipment.—General Electric Company, Schenectady, N. Y. Booklet on incandescent radiators, which consist of an ornamental cast iron frame fitted with a polished copper reflector in the back and with large cylindrical incandescent heating lamps. Bulletin 4584, issued by the same company, describes the CQ motor for direct current circuits, which is made up to 20 hp. in size. Bulletin 4576 describes oil switches for panel installation and remote controller. Bulletin 4579 is devoted to luminous arc headlights, and bulletin 4578 treats of railroad motor controllers.

Power Hammers.—Beaudry & Co., Inc., 141 Milk street, Boston, Mass. Bulletin. Describes the Beaudry champion power hammer, which is made up to 9000 lb. in weight.

Die Stocks.—William P. Walter's Sons, 1233 Market street, Philadelphia, Pa. Brochure. Devoted to the Forbes die stocks, for hand power and pipe mill machines, and pipe cutters and vises. Price-lists and directions for ordering are given.

Centrifugal Pumps.—Alberger Pump Company. Catalogue A, 6 x 9 in., 32 pages. Describes the development and theory of centrifugal pumps and the design and construction of the Alberger volute pumps, which are known as the standard regular two-stage and turbo volute types. Illustrations are given of the standard volute pumps, motor driven and belt driven, and the volute pump, engine driven. The other illustrations include two-stage volute pumps, centrifugal condensers and the Alberger turbine pumps.

Welding.—Goldschmidt Thermit Company, 90 West street, New York. Pamphlet showing methods of butt welding wrought iron and steel and pipes and rods by the thermit process.

Rock Crushing and Road Building Machinery.—American Road Machine Company, Kennett Square, Pa. Catalogue, 7 x 9½ in., 60 pages. Illustrates and describes rock crushers and a general line of road building machinery.

Piston Pumps.—International Steam Pump Company, New York. Bulletin B K-811. Illustrates a new type of vertical duplex pumps suitable for boiler feeding.

Compressed Air Hoisting Machinery.—Detroit Hoist & Machine Company, Detroit, Mich. Catalogue. Shows pneumatic geared hoists which are made to handle loads of from 1 to 10 tons. Sectional views of standard types of hoists are shown; a diagram of the outside dimensions of pneumatic stationary engine made by the company is given, and a pit car loader and a combination loader and conveyor operated by compressed air and manufactured by the company are shown.

Chucks.—Cincinnati Chuck Company, Cincinnati, Ohio. Price-list showing the four-jaw chuck, which is made in sizes from 8 to 24 in.

Punch and Shears.—Cincinnati Punch & Shear Company, Cincinnati, Ohio. Catalogue No. 11, 6¼ x 9¼ in., 64 pages. Principally devoted to punch and shears, which are made by the company in all the standard sizes. The machines are illustrated and described and the book includes views of the double punch and shear, combined punch and shear, and a special machine with a 36-in. throat, which can be used as either a punch or shear by changing the attachment. A small part of the volume is given over to bending and straightening rolls and rolling mill machinery.

Electric Traveling Cranes.—Alfred Box & Co., Philadelphia, Pa. Catalogue, 7 x 9¼ in., 48 pages. Numerous illustrations of traveling cranes are given, including two 60-ton, 74-ft. span cranes installed in the locomotive shops of the Missouri, Kansas & Texas Railroad, at Parsons, Kan. A general description of the Box standard cranes is given, together with views of sections of machines, such as trolleys, hoisting crabs, motors, &c. A list of users of the firm's cranes is included, together with directions for ordering.

Clutches.—Sturtevant Mill Company, Boston, Mass. Booklet. Views of ore breakers and rock crushers are included in this volume, with prices. These machines are made of rolled plate steel, and the booklet contains arguments in favor of crushers made of this class of material as against cast iron. The company makes steel plate crushers up to a capacity of 150 tons an hour.

Planers.—Whitcomb-Blaisdell Machine Tool Company, Worcester, Mass. Folder. Shows a second-belt drive planer which is built in standard sizes, from 7 to 30 in. The second belt drive is a comparatively new method of operating planers and it is applied, the folder states, to all sizes of Whitcomb planers.

Portland Cement.—Universal Portland Cement Company, Chicago and Pittsburgh. Catalogue, 6 x 9 in. Gives the history of the manufacture of universal Portland cement and illustrates samples of the materials of which it is composed. Bridges, railroad construction and buildings where the cement has been

used are illustrated and a number of tests are cited. The catalogue is accompanied by the May bulletin of the company, showing recent construction work in which this cement has been used.

Radiators and Condensers.—Long-Turney Mfg. Company, Rome, N. Y. Catalogue, 6 x 9 in., 31 pages. Advocates the company's vertical tube radiators for automobiles and illustrates styles adaptable to different machines.

Forging Tools, Punching and Shearing Tools and Railroad Shop Equipment.—Williams, White & Co., Moline, Ill. Catalogue, 7 x 11 in. This is a good sized volume showing the firm's line of bulldozers, upsetting and forging machinery, punches and shears, gang boring machines, &c. Considerable space is given showing the work that has been done by these machines, and cross sections of an upsetter are shown, together with an illustration of the firm's exhibit at the World's Fair in St. Louis, 1904.

Boiler Compounds.—H. W. Johns-Manville Company, New York. Booklet. Devoted to magic boiler compound. It is claimed that this compound does not dissolve the boiler scale, but loosens it from the iron. The effect on the boiler is as a preventive rather than otherwise, it is claimed.

Power Pumps.—Lucas Pump Company, Dayton, Ohio. Brochure. Contains illustrations and descriptions of the company's line of power pumps and some space is given to self-starters for electric motors.

Boilers.—Traylor Engineering Company, 2 Rector street, New York. Booklet. Describes the Hawkes boiler, which is a combination of the horizontal return tubular and water tube type. Details of the construction of the boiler are given and a number of installations are shown, together with sectional drawings of the apparatus. Space is given to foundry ladles and riveted and welded pipe made by the company.

Crane Fittings.—Electric Controller & Supply Company, Cleveland, Ohio. Bulletin No. 281. Arranged for loose leaf catalogue. Gives prices and descriptions of crane settings, such as trolley wheels, trolley contacts, fuse blocks, circuit breakers, knife switches, &c.

Variable Speed Motors.—Lincoln Motor Works Company, Springfield, Ohio. Bulletin No. 10. Consists of 16 pages describing variable speed motors and including detailed drawings, speed and efficiency charts, table of ratings and general outlined dimensions. A motor is shown driving a large engine lathe.

Vertical Gas Engines.—Bruce-Merian-Abbott Company, Cleveland, Ohio. Catalogue A, section 1. Treats of the adaptability of vertical gas engines for electric lighting, pumping and general power purposes. The engine is built in two types, one for operating on natural or illuminating gas and another for operating on producer gas. It is argued that these engines are especially efficient and economical for medium sized lighting plants. The engines are of the vertical multiple cylinder type, operating on the four-stroke cycle principle. The catalogue is illustrated with a full view and a cross section view of a 100-hp. engine, and several of the more important parts of the machine are shown and described. Views are also given of a producer gas outfit and a suction gas producer made by the company.

Rail Bonds and Appliances.—American Steel & Wire Company, Chicago, Ill. Folder supplementing 1907 catalogue. Illustrates several types of rail drills used in the installation of twin terminal bonds.

Magnetos.—Boch Magneto Company, 160 West Fifty-sixth street, New York. Catalogue. Illustrates and describes the Boch magneto for cycle motors, arc lights, automobile motors, &c., made in a number of different types, including low and high tension magnetos and special low tension magnetos for magnet plug ignition.

Steam and Oil Separators.—Ohio Blower Company, Cleveland, Ohio. Catalogue No. 116. Size 6 x 9 in., 79 pages. Describes the Swartwout cast iron exhaust head and centrifugal steam and oil separators, made in a number of types. Views of the apparatus are shown, including two exhaust heads of the 36-in. condenser type made for the Utah Copper Company for use in the largest copper smelting plant in the world, at Garfield, Utah. Views of buildings in which the exhaust heads have been used are given and sectional drawings of the apparatus are shown. The volume includes descriptions of oil separators, steam separators of various types and interesting tables and other useful data.

Clutches, Chain Speed Gears, Metallic Tire Cases.—Merchant & Evans Company, 517 Arch street, Philadelphia, Pa. Catalogue, 8 x 10¼ in., 40 pages. Contains illustrations of the Hele-Shaw clutch for motor cars, boats, &c., with views of unassembled parts and sectional drawings. Space is also given to friction disks, change speed gears, metallic tire cases, automobile axles, springs, clips, shackles and other accessories.

Chucks.—Skinner Chuck Company, New Britain, Conn. Booklet. Shows various types of chucks, giving price-lists. The company makes drill chucks, lathe chucks, planer chucks, scroll chucks, two-jaw chucks, &c.

The Lake Superior Mining Institute.

DULUTH, MINN., June 27.—The thirteenth annual meeting of the Lake Superior Mining Institute has been in session this week on the Minnesota iron ranges. It began Wednesday afternoon. Special trains of sleeping, dining and private cars carried the members on their rounds of the ranges.

The session began on Wednesday with an informal reception and smoker at the Northland Country Club at Duluth. Trips to the works of the Great Northern Power Company, the Minnesota Steel Company, the Zenith Furnace Company and various other points of general interest around the city were arranged by the local committees.

On the Vermillion Range.

On Thursday morning the trains were sidetracked close to the Pioneer mine, at Ely, and a surface inspection was made of the various mines of the "Ely trough," including the Pioneer, Zenith, Savoy and Sibley. The Chandler, the original mine of the district, is now practically exhausted. This mine produced since 1888 a total of 9,150,000 tons. The other mines named are all operated by the Oliver Iron Mining Company and last year produced a total of 1,582,290 tons. The underground haulage system of the Pioneer, the various steel shafts of great capacity, that at the Pioneer having a capacity for hoisting 100,000 tons per month, the shafthouses, some of them 165 ft. high and of steel construction, and the automatic hoisting machinery were all worth close examination. These mines of Ely have produced since opening a total of 18,631,606 tons. No visit was made to the famous "section 30," for no development is under way there, the costly explorations that have been in progress for some years being now suspended.

A stop of a few minutes was made at Soudan, after leaving Ely, on the way to the Mesaba range. At Soudan is the old Minnesota mine, the original iron mining property in the State, from which 8,200,000 tons have been mined. This mine, which last year produced only 102,000 tons, was the reason for the construction of the Duluth & Iron Range Railroad and the formation of the Minnesota Iron Company, with its capital of \$8,000,000, and was what led Charlemagne Tower, the elder, to invest half that sum in the development of the district. At the time Mr. Tower began his investment there was not to exceed 100,000 tons of ore in sight at the mine—and no thought that any more mines existed in the State,—which is an interesting comment on the boldness, intrepidity and, withal, of the sublime assurance of ignorance, with which that vast investment was made. Last year the Minnesota produced only 1.24 per cent. of the tonnage of the road, and if it were still the only mine on the railroad, the latter could not be operated.

On the Mesaba Range.

In the afternoon of Thursday there was a brief inspection of the Biwabik mine, which is operated by the Biwabik Mining Company and was notable in the early days of the Mesaba by reason of the exceptional boldness of the plans for its stripping, the rapidity with which its tonnage was increased, and the consequent scare it gave old range operators at a time when the industry was at low ebb, and for the excellent character of its ore. There have been taken from the surface of this mine more than 4,000,000 cubic yards of overburden, and it has produced 8,250,000 tons of ore. From Biwabik the party visited the Adams, Spruce and Fayal mines at Eveleth, all of which are operated by the Oliver Iron Mining Company, and which last year produced a total of 3,685,782 tons of ore, and since their opening, in 1895, 28,959,831 tons. At these mines all the various systems of mining in vogue on the Mesaba were to be seen. From the open cuts of the properties there have been taken a total of 9,725,000 yards of overburden. From Eveleth the party went to Virginia, where some time was spent in examination of the Oliver group, the Republic Iron & Steel group, the Corrigan, McKinney & Co.'s Commodore mine, and the Jones & Laughlin group, some surface and some underground. From the Oliver group alone, which is now under extensive development, there has been removed 2,550,000 yards

of surface above the ore. The first evening session for business and the reading and discussion of papers was held there.

Papers presented include the following: "Sampling of Iron Ores," by Prof. L. S. Austin, Houghton, Mich.; "Biographical Sketches," by John H. Harding, Eveleth, Minn.; "Oliver Iron Mining Company's Standard Boiler-House," by A. M. Gow, Duluth; "Automatic Throttle Closing Device for Hoisting Machinery," by Spencer S. Rumsey, Duluth; "The Hydro-Electric Plant of the Great Northern Power Company on St. Louis River," by Francis A. Cokefair, Duluth; "Coleraine," by M. Curley; "The Late Hon. Peter White, of Marquette;" "The Hydro-Electric Plant of the Penn. Iron Mining Company at Sturgeon Falls, Mich.," by Messrs Orbison and Armstrong; "A Reconnaissance Along the West Mexican Coast," by Dwight E. Woodbridge.

At Virginia, Hibbing and Coleraine.

On Friday the Mountain Iron open cut mine of the Oliver Company was seen. This was the initial property taken by the famous Carnegie-Oliver coalition, being secured from the Rockefeller interests in 1898, and thus it formed the basis, with the Oliver of the Virginia group, for the Oliver Iron Mining Company. It is opened in a tremendous manner and a yardage of nearly 5,000,000 has been taken from it, aside from about 17,000,000 tons of ore. During two consecutive years the mine produced more than 5,000,000 tons of ore alone. The Monroe-Tener group was visited for an inspection of advanced methods of opening for underground and milling processes, and for the elaborate and extensive system of underground electric haulage in place there. This property, while a vast sum has been spent in development, and while many millions of tons are ready for mining, is not producing very largely on account of the grading system of the company. The latter is able to conserve the leaner ores near its surface until such time as the increased tonnage from the range shall make it possible to mine and mix these leaner ores to bring an average grade, and that without sacrificing either the high grade or the poorer material in this immense deposit. In three years the company has removed 3,875,000 yards of overburden from this property and made a vast pit of great depth.

Most of the day was passed at Hibbing, where there are more mines than at any other point, and where the extent of operations is very great. The Hull-Rust alone has stripped 4,400,000 yards, all in about two years; the Burt 4,000,000 and the Mahoning 3,500,000. It was impossible to visit many of the important outlying mines near Hibbing, such as Stevenson, Leetonia, and the like, and after a business session the trains proceeded to Coleraine, the scene of the Oliver Iron Mining Company's vast activities in the development of low grade ores of the western Mesaba. These are ores that can be concentrated into merchantable condition by washing, and an experimental washery is in operation on the shores of Trout lake. The stripping development at this point is especially noteworthy not alone from its magnitude, though 2,475,000 yards have been taken off in less than two years, while less than 18,000 tons of ore have been shipped to this time, but from the labor saving methods utilized and in the amount of earth removed from month to month. The town of Coleraine is owned by the company, and a most successful attempt is being made to build up here a model dwelling place in which there shall be all possible comforts and conveniences, and inducements for the best class of residents to become permanent citizens. Large sums are being spent, and able minds are directing matters, toward this end.

The session ends at noon to-day with the departure of the party from Coleraine by train for Duluth.

D. E. W.

At New Haven, Conn., Frank McGee, a business agent of the Iron Molders' Union, was found guilty by a jury last week on three counts, alleging intimidation in connection with a strike at the McLagon Foundry Company's plant last year, and was sentenced to three months' imprisonment on each count. An appeal has been taken to the Supreme Court.

The Static and Dynamic Properties of Steels.

BY W. L. TURNER.*

We have now arrived at a time when engineers and manufacturers, engaged either in the direct production of, or compelled by necessity to make a selection from, one or other of the numerous alloy or special steels now in the market, are set face to face with the problem of determining the relative merits of the materials at their disposal. The reason for this necessity of choice will be apparent when investigation is made into the limits which ordinary steel imposes on the user, due either to lack of strength, want of toughness, or failure to respond to the ever-increasing demands of engineering practice. It cannot be readily denied that conditions nowadays are such that designers in machine construction have, in many instances, arrived at the limits imposed upon them by the materials at hand. Future requirements, should they continue to grow at the present rate, will only be satisfied by recourse to one or all of the following expedients:

1. Radical, but correspondingly uncommercial and inefficient, changes in proportions.
2. Continuation of present proportions involving trespass upon the customary, but arbitrary, factors of safety.
3. Adoption of more suitable and higher quality materials of construction.

The last named alternative would seem to be the only admissible one, provided that such materials exist in a commercial sense. The steel maker, in order to demonstrate this, has shown that, by the judicious use of various other metals as alloys in his products, great superiority as regards static strength may be attained, and this without undue forfeiture of that toughness which is only to be found in the milder forms of carbon steel. Many such static intensifiers, some of which incidentally enhance the ductile qualities of their steels, are in daily use by the steel makers, the more common metals being chromium, nickel and vanadium.

Most Thorough Investigation Necessary.

That the behavior of different alloy steels in service varies very considerably for the same static strength is a matter of common knowledge, but hitherto few attempts have been made to classify them except according to tensile properties. We are confronted with the problem of securing the best means to make investigation into the relative merits of these steels, assuming that, for purposes of argument, tensile strengths are equal. Too much reliance is generally placed upon the limited information furnished by the static tension tests, with the result that numerous failures in practice are often inexplicable. It behoves us to look for other devices which will, in a commercial manner, divulge something concerning the other properties of steel.

It is just as essential to know the probable behavior of a given material in service as to be satisfied as to what steady load it will sustain without permanent set. Empirical safety factor formulae have, from time to time, been enunciated for the use of designers of structures subjected to live loads. Such formulae vary considerably, according to the purpose to which they are to be applied,—a fact pointing to incongruity and absence of special knowledge regarding some important properties of the materials of construction. We have long understood that materials are prone to degenerate in quality at a rate depending upon the service which they undergo.

The term "crystallization," which has caused some very bitter feeling in the steel world, is a name given to designate those phenomena which we have recognized but not very deeply studied. It presupposes secular deterioration in the metal, due to the influences of shock and alternating stresses, whether pure or combined. The name has been advantageously altered to "inter-molecular disintegration," but, whatever we choose to call it, there remains the evidence that some modification

takes place in the structure of steel when the above named forces are to be dealt with.

Resistance to Fatigue Not a Function of Static Strength.

The numerous every-day failures which cannot be accounted for are forcing us further and further to make research and investigation into the action on steel and iron exerted by complicated kinematic forces and to realize the fact that resistance to fatigue is not a function of static strength. We actually have, as is proved by the grades of steel we use in practice, a good general idea of the relative "dynamic" properties of carbon steels, but this idea has only been acquired after laborious systems of trial and error. We have never gone so far as to suspect that alloy steels would behave very differently in this respect—indeed, we have not had the appliances to give any such information.

As an example of our knowledge of the "life" properties of ordinary steel, I would quote the case of the staying of a locomotive fire-box. Something is required which will possess considerable strength combined with the power to withstand a moderate degree of flexure in all directions. With absence of empirical knowledge, a *prima facie* reason for the adoption of high carbon steel is here presented, owing to its possession of higher strength and consequently the capability to withstand a larger degree of deflection without permanent set. Experience, however, has shown that the use of anything but the mildest steel for this work is prohibitive, and that wrought iron, or even copper, is still more satisfactory.

Steel, according to its composition, or rather according to the manner in which the component elements are inter-united, is prone to deteriorate rapidly or "crystallize" under the fatigue of continued reversals of stress. The importance of investigation of this subject has been fully demonstrated by J. Kent Smith (the pioneer of vanadium), Prof. Arnold of Sheffield and others. The classic researches of Wohler, Baker and Martens have opened the gate for us, but that is all. It is necessary to supplement their work commercially, that is, by making every-day dynamic tests, just as we do with the tensile machine. It is unfortunate that, while there are many so-called dynamic machines available at the present time, the majority of them are not practicable for routine use, inasmuch as very considerable time is required for the completion of their tests; moreover, unless an intelligent interpretation is applied to the results, no very useful information is forthcoming.

The writer has just completed a preliminary investigation into the relative dynamic properties of iron and the various ordinary and alloy steels, the results being set forth in the accompanying tables. To what extent the figures here shown are strictly comparative is a matter of opinion, but the writer would like to say that his experience has been that the "alternating impact" machine, hereinafter described, shows a higher power of discrimination between good and bad material than any other appliance yet devised, seeing that the results are substantially confirmed by practical experience over an extended period.

Conditions of the Test.

The tensile tests were performed in the usual manner, the diameter in each case being $\frac{1}{2}$ in. and the elongation measured over a length of 2 in. The conditions of the "dynamic" tests were as follows:

A cylindrical test piece, carefully finished with emery to remove all tool marks, is firmly clamped at one end in a vise. The sample is 6 in. long and $\frac{3}{8}$ in. in diameter. A tool steel head, in which there is cut a slot, is placed over the other end, the distance from the striking center of this head to the vise line being 4 in. A crank and connecting rod furnish the reciprocating motion for this head, thereby causing the test piece to be deflected a certain distance (in this case it was $\frac{3}{8}$ in.) each side of the neutral position. In addition to this alternating flexure, the test piece is also subjected, at each reversal, to an impact, due to the slot on the reciprocating head. By this arrangement, a very important factor is introduced, seeing that hitherto no tests have combined reversals of stress with rapidly repeated shocks.

* American Vanadium Company, Pittsburgh, Pa.

The sample under trial, which undergoes 650 alternations per minute, is pulled out of the machine after fracture by a spring, and a suitable arrangement is attached which counts the total number of alternations endured. A deflection of $\frac{3}{8}$ in. a side has the effect of imparting a permanent set to the test piece—a condition considered by experts to be necessary for the estimation of the fundamental properties of materials to resist vibratory deterioration. From the formulae for the deflection of beams, the stress produced on the outermost fibers by this bending would, if the material remained elastic, be in the neighborhood of 400,000 lb. per square inch, which is of course sufficient to permanently distort all known metals.

The experiments were carried out with long test pieces (8 in.), which, by reversal, permitted of two tests being obtained from one sample, thereby securing an indication of the uniformity of the particular steels. On each class of steel a large number of dynamic tests were made, an average being taken of the results after elimination of those figures which were apparently abnormal.

Remarks on the Results.

It is apparent from the figures here shown that the dynamic properties of steels vary very largely according to composition as well as to static strength. No claim is made that the tests are in any way complete or final, the idea simply being to demonstrate, by a process of trial and error, the comparative behavior of the several metals experimented upon. Various steels were taken, analyzed and tested, without attempt to classify them rigidly. In spite of this, the general characteristics of individual alloys are observed by noting the effect produced by the addition or omission of the particular metal. The results have been grouped into three tables, which are arranged according to elastic limits. All the steels in a particular table may, more or less, be applied to a given purpose, whereas any taken from another group would probably be found unsuitable. One of the reasons for such classification is in order that a comparison could be shown with regard to quality, between the several steels comprising a group, and for this purpose a "quality figure" has been chosen to take account of the principal factors in the test.

It appears highly probable that we are fast approaching a time when engineers will be forced to recognize combined static and dynamic properties of steels by including such a quality figure in their specification. It is of course patent that comparisons of quality are useless and misleading if made between very mild and very hard materials, but when no very great dissimilarity exists between the fundamental properties, such a mode of distinction is not only practicable but even advisable. The idea of a quality figure is not by any means new, since it has been adopted by numerous manufacturers, especially by those engaged in the boiler and ship-plate trades, but the multiplicity of the formulae suggested and the fact that there is no standardization have hindered the universal adoption of such a co-efficient. The writer has taken an arbitrary quality figure which is designed to comprise the three most important attributes of constructional steel, which are as follows:

1. Elastic limit—showing the range of load commercially available. This figure is largely preferable to tensile strength for the good reason that a material is practically valueless after the stresses have exceeded the yield point. The widely varying ratios of elastic limit to ultimate strength, especially in the case of alloy steels, will not permit of the continuance of the prevalent practice of regarding this ratio as constant. Factors of safety must sooner or later be based upon the range of the material's elastic condition.

2. Reduction of area—chosen for various reasons, as the measure of static ductility in preference to percentage elongation. Engineers regard the latter factor as being somewhat unreliable, owing to the extent to which it is affected by influences such as diameter of test piece, &c.

3. Dynamic figure—or measure of power of fatigue resistance.

Results of Some Comparative Tests Made on All Grades of Iron and Steel to Determine Relative Strengths and Properties of Fatigue Resistance.—The Results on Each Steel are Collectively Combined Into a "Quality Figure."

No.	Material.	Heat treatment.	C.	Approximate chemical analysis.	Elastic limit.	Tensile stress.	E. I. Ratio.	Elong. %	Reduc. of area %	Dynamic figures, EXBXA	Process of manufacture.	Remarks.
				Cr. Ni. Elastic limits, 30,000 to 60,000.	(E.)					10 ⁴		
1.	Wrought iron.	Raw	0.05	0.05	32,020	49,450	64.7	42.5	53.8	1,004	.....	As used for staybolts.
2.	Mild vanadium steel.	Raw	0.11	0.19	32,120	54,400	59.0	44.0	60.1	553	Open hearth.	Scrapped after service.
3.	Old boiler plate.	Raw	0.24	0.42	38,160	70,840	82.1	25.5	53.4	1,111	Open hearth.	Shafting steel.
4.	Mild carbon steel.	Raw	0.18	0.40	39,460	60,650	65.1	35.0	62.6	871	Open hearth.	.....
5.	Carbon forging steel.	O. T. 900/425.	0.18	0.40	43,010	70,030	64.6	33.0	64.0	777	Open hearth.	.....
6.	Carbon forging steel.	.....	0.28	0.28	43,010	70,850	69.5	34.0	63.4	1,415	Open hearth.	.....
7.	Carbon forging steel.	O. T. 900/550.	0.23	0.25	52,230	77,810	67.5	28.0	65.3	1,175	Open hearth.	.....
8.	Vanadium case hardening steel.	.....	0.15	0.12	44,790	55,990	80.0	45.0	69.0	1,958	Open hearth.	.....
9.	Chromium nickel steel.	.....	0.36	0.30	56,520	81,370	69.5	32.0	68.5	3,787	Crucible.	Sliding gear steel.
10.	Chromium steel casting.	.....	0.19	0.65	34,690	58,800	57.0	28.0	44.9	269	Acid open hearth.	.....
11.	Vanadium steel casting.	.....	0.19	0.60	41,340	70,250	63.0	25.5	44.9	1,671	Acid open hearth.	.....
12.	Cr-Va-Steel casting.	.....	0.57	0.68	52,330	92,900	56.3	16.0	20.5	704	Basic open hearth.	Used for car wheels.
13.	Nickel forging steel.	.....	0.21	0.45	61,140	79,700	76.7	30.0	62.5	746	Basic open hearth.	.....
14.	Nickel forging steel.	O. T. 900/550.	0.21	0.45	77,140	98,470	78.3	25.0	65.3	2,851	Basic open hearth.	.....
15.	Chromium-vanadium forging steel.	.....	0.26	0.50	61,920	92,900	66.6	25.0	57.3	3,345	Basic open hearth.	Known as type A.
16.	Chromium-vanadium spring steel.	.....	1.00	0.30	63,800	125,000	51.0	8.5	15.2	1,608	Open hearth.	.....
17.	Chromium-vanadium spring steel.	.....	0.40	0.77	67,520	100,600	67.1	26.0	61.7	1,222	Crucible.	.....
18.	Chromium-nickel-vanadium steel.	.....	0.30	1.22	69,140	96,880	71.3	26.0	68.5	5,858	Crucible.	Known as type D.
19.	Nickel-vanadium steel.	.....	0.24	1.51	79,260	99,700	79.5	25.0	64.0	2,402	Crucible.	Imported automobile steel.
20.	Chromium-nickel-vanadium steel.	.....	0.57	0.93	95,150	129,100	73.7	21.0	49.8	798	Basic open hearth.	.....
21.	Chromium-nickel steel.	Tempered	0.37	0.89	86,080	109,700	83.8	22.0	63.8	4,659	Crucible.	.....
22.	Chromium spring steel.	O. T. 900/450.	1.00	0.30	101,000	186,300	54.2	9.5	16.1	3,855	Crucible.	.....
23.	Chromium-vanadium spring steel.	.....	0.40	1.22	195,300	298,500	93.7	10.0	36.3	561	Open hearth.	Spring temper.
24.	Chromium-vanadium spring steel.	O. T. 900/450.	0.30	0.77	141,600	151,750	93.0	16.0	56.2	3,403	Acid open hearth.	Spring temper, type D.
25.	Nickel-vanadium steel.	.....	0.24	1.00	129,900	134,600	96.4	18.0	64.8	3,705	Basic open hearth.	Type A, crankshaft temper.
26.	Chromium-nickel-vanadium steel.	.....	0.30	0.72	152,300	139,900	95.2	17.0	58.9	5,270	Basic open hearth.	.....
27.	Chromium-nickel-vanadium spring steel.	O. T. 900/550.	0.30	0.72	152,300	139,900	95.2	17.0	58.9	4,369	Crucible.	Imported automobile steel.
28.	Chromium-nickel steel.	.....	0.36	0.95	134,500	187,600	97.7	14.0	50.6	4,583	Crucible.	Type D.

Notes.—Static tests made on samples $\frac{1}{2}$ in. diameter x 2 in. long. Dynamic tests made on the Landgraf-Turner alternating impact machine (old form). The quality figure is the product of: Elastic limit, representing useful strength; reduction of area, representing static ductility; dynamic figure, representing fatigue resistance. $\times A \div 10^4$. O. T. = Oil tempered.

Dynamic Effects of Nickel and Vanadium Alloys.

There are several noteworthy features with regard to the actual figures to be observed by the steel user. Of these, perhaps, the most striking is the extraordinary difference subsisting between the dynamic effects conferred on steel by the alloys nickel and vanadium. The differences are so strongly marked that the future investigator should be encouraged to make deep research on the lines previously suggested, and thereby put himself in a position to realize the importance of this new field.

It is very apparent, right through the list, that the action of nickel is twofold: 1. It statically intensifies. 2. It dynamically "poisons." As an instance of this, take tests Nos. 13 and 15, the former being a 3.7 per cent. nickel steel and the latter a chrome-vanadium variety. In the annealed condition, the elastic limits of the two are almost identical, but at the same time the alternations of stress endured by the latter are two and a quarter times the number sustained by the nickel steel. Take again Nos. 17 and 18. The dynamic figures are more than three to one in favor of the chrome-vanadium product, whereas the difference in elastic limit is only about 3 per cent. Surely such figures as these should call attention to the peculiarities of the nature of alloys.

The writer has noticed, over a long period of time, that nickel will dynamically poison the steel containing it, though the effects may be modified to some extent when another element is used in conjunction. The influence of the small content of vanadium in steel No. 18 is not perceptible, being outweighed by the large proportion of nickel. Test No. 20 shows to what extent the dynamic virtue is improved by the removal of about 40 per cent. of the nickel. The reader may select other tests as he wishes, only to find in each case the disturbing influence of this element and the corresponding ameliorating effects wrought by the metal vanadium.

These tests also lead us to the conclusion that the common assumption that the ductility figures shown by tension tests give reliable indication regarding dynamic virtues is evidently erroneous, though there can be no doubt that it holds fairly well for the same type of steel under different conditions of heat treatment. Nickel tends to enhance ductility as much as or even more so than vanadium, but as to their powers of fatigue resistance there can be no comparison.

Differences in Quality.

It is equally manifest that the static action of vanadium is similar to that of nickel, but that its dynamic effects are the exact converse. The differences are markedly brought out in the quality figures, which invite attention as to comparison with those of ordinary carbon steel. Taking the latter as standard, the chrome-vanadium steels are as much above it as the nickel steels are below it. Microscopic investigation will furthermore confirm the assertions made in this article. The structure of nickel ferrite, as revealed by the microscope, shows a crystalline arrangement which would not naturally be expected to offer as much resistance to molecular disintegration as does carbon steel, but, in the case of vanadium, the whole structure is exceedingly well interlocked, giving one the impression that the constitution would be ideal for hard service conditions.

Chromium, *per se*, does not appear to exert appreciable influence other than statically, but it is possible that the effect of this metal in a ternary steel might be very marked.

The writer has noticed that the dynamic attributes of plain carbon steel reach a maximum with about 0.25 per cent. carbon content, falling away on both sides of this amount.

The somewhat low figure shown by wrought iron is anomalous. It may be partly due to the unhomogeneous nature of this material, and partly due to the fact that the test piece was turned down from a 1 in. bar, and, therefore, would not have had very much forging work done upon it.

The quality figure in the case of the chrome-vanadium steel does not appear to undergo much alteration in the process of oil tempering, but there are considerable variations in other cases. The dynamic test may eventually

act as a reliable guide to the correct methods for the heat treatment of individual steels.

Owing to lack of space, it is impossible to make more than cursory mention of other subjects which are brought to notice by these tests. The question of price has not been touched upon, but it is fitting to say here that the open hearth chrome-vanadium steels compare very favorably with the nickel product, and of course are vastly cheaper (fully 50 per cent.) than those manufactured in the crucible. Strength for strength, the chrome-vanadium steels also have the advantage over all others as regards machining properties, which, with certain users, are very important items. With regard to forging and drop forging some alloy steels, notably chrome-nickel, an enormous amount of work, necessitating expenditure, is requisite for such a process, and furthermore extreme caution must be observed in the heating operations. Chrome-vanadium steel may be forged with the same ease as ordinary steel of similar carbon contents, no special precaution being necessary as to temperatures.

In conclusion, the author would like to recommend to those who criticise his results, and to those who are interested in the kinetic testing of materials, a paper entitled, "Factors of Safety in Marine Engineering,"* read before the Institution of Naval Architects by Prof. J. O. Arnold of Sheffield. In it he advocates the form of test adopted by the writer and furthermore shows how it will detect unreliable material where other dynamic machines fail.

Ferroalloys in the Foundry.†

BY W. M. SAUNDERS, PROVIDENCE, R. I.

The manufacturer of steel has found that the addition of certain metals endows the steel with properties it did not before possess. The foundry metallurgist, observing the effect of these valuable additions to steel, naturally turned to the same metals for improving cast iron. For many years the high cost prevented a very extensive use of these metals, but within a few years improvements in methods of manufacture, due in part to the progress made in the use of the electrical furnace, or the discovery of new deposits of ore in more accessible localities, have lowered the price. At the present quotations, with few exceptions, the cost prohibits the use of these metals very extensively, except in special cases where castings are required demanding unusual qualities.

Most of the metals employed melt at a higher temperature than cast iron and consequently do not react to the best advantage with the iron. This difficulty has been overcome by first making an alloy of iron and the metal, which alloy melts at a lower temperature and easily diffuses throughout the cast iron. The manufacture of ferroalloys has an important place in modern industry, and their electrical production has increased until it is of considerable value.

Manganese.

About 1886, R. A. Hadfield discovered that steel with 1.5 per cent. manganese became brittle. With 5 to 7 per cent. manganese it became very brittle. With the addition of manganese above this amount, the steel began to lose the property of brittleness and assumed that of toughness and hardness. These qualities greatly increased in the presence of a certain amount of carbon and the proper heat treatment, until the steel contained about 12 per cent. manganese, when it became exceedingly tough and hard. This material is known as Hadfield steel.

The effect of manganese upon cast iron resembles in many ways that upon steel. High manganese castings are employed only in special cases where exceptional hardness is desired. Castings with 1 to 1.5 per cent. manganese are sometimes made, but the best results are obtained in gray iron with manganese under 1 per cent.

Ferromanganese in the foundry has an important part to play in perfecting cast iron. It has been claimed that

* See *The Iron Age* of June 18, page 1938.

† From a paper read at the Toronto meeting of the American Foundrymen's Association, June, 1908.

ferromanganese makes hard iron soft and soft iron hard. This anomaly is not difficult to explain. Cast iron with a low percentage of manganese often gives trouble in machining, by causing the drills or tools to become dull. This trouble at once disappears upon adding enough ferromanganese to bring the manganese to 0.5 per cent. High manganese pig iron added to the charge in the cupola will also give the same result.

Manganese reduces the tendency of cast iron to chill, and consequently when ferromanganese is added in small quantities in the ladle, the iron becomes softened. Advantage is taken of this fact by car wheel makers who add a small amount of ferromanganese to the molten iron just before casting and thus improve the strength and endurance of the wheel.

Ferromanganese hardens cast iron by increasing the percentage of manganese. A cast iron may contain the requisite amount of manganese for good machining, but it is necessary to make the iron hard and tough for cylinder purposes. With the addition of enough ferromanganese to raise the manganese to 1 per cent. or over, the desired hardness is produced.

Ferromanganese removes sulphur from cast iron by forming a compound of sulphur and manganese which rises to the surface as slag, but only when the iron is very hot. It is also beneficial in removing oxides from the iron, the manganese seizing the oxygen combined with the iron, forming manganese oxide which rises to the surface of the molten metal and passes off as slag.

Silicon.

Cast iron with 4 per cent. silicon shows weakness, but not as marked as in steel. As the silicon in cast iron increases above 4 per cent., the hardness and brittleness become very apparent.

Ferrosilicon melted in a cupola with cast iron in the right amount tends to soften the iron and reduce strength. A. E. Outerbridge, Jr., found the addition of a high grade ferrosilicon (about 50 per cent. silicon) to the molten iron in a ladle not only softened the iron but increased the strength from 15 to 25 per cent., as shown in transverse test bars.

Overheated iron in an air furnace often may be restored to the right condition upon adding a sufficient amount of ferrosilicon; the silicon deoxidizing the iron, leaving it in the proper state for good casting.

Silico-manganese, containing from 35 to 70 per cent. of manganese, and 20 to 25 per cent. silicon, the remainder chiefly iron, is sometimes used to raise both the silicon and manganese in cast iron; its action being similar to a mixture of ferrosilicon and ferromanganese.

Carbide of silicon, containing about 60 per cent. silicon and 30 per cent. carbon, is occasionally used in steel making as a deoxidizing agent. In the foundry it is not generally employed on account of its high melting point, but when used is charged in the form of lumps with the pig iron in the cupola. The effect of carbide of silicon is to increase the silicon and carbon to some extent.

Aluminum.

In cast iron the influence of aluminum resembles in many ways that of silicon. A white cast iron to which $\frac{1}{2}$ to 1 per cent. of aluminum has been added assumes at once the appearance of gray iron.

In 1890, W. J. Keep published the results of his experiments upon the addition of aluminum to cast iron. He found that the addition of aluminum increased the proportion of graphitic carbon, and the softening of the iron increased up to 4 per cent. Aluminum added in large amounts reduces the total carbon by throwing out the graphite. Aluminum diminishes the tendency of cast iron to chill; it also reduces shrinkage and increases strength when in small amounts. About 4 per cent. aluminum the softening influence begins to diminish, and the strength of the iron becomes less, until cast iron with 12 to 14 per cent. aluminum is very weak.

Phosphorus.

In the foundry ferrophosphorus is employed to increase the phosphorus in cast iron in the ladle, when it is desired to prolong the time of fluidity, as in the case of very thin castings.

Cast iron containing about $1\frac{1}{2}$ per cent. phosphorus causes the tools used in machining it to become heated

and quickly worn, while with 2 per cent. and over, cast iron becomes brittle and weak.

Phosphorus under 1 per cent. in general machinery castings is desirable, and in some cases as low as 0.2 per cent is necessary to secure strong iron.

Titanium.

In the form of ferroalloy and also as titanium thermit, titanium is used in small amounts in steel making and in the iron foundry to remove gases absorbed by the molten metal. The action is purely chemical, the titanium combining with oxygen forming oxides, and with nitrogen forming nitrides of titanium, the resulting compounds being found in the slag; none of the titanium entering into the iron, which remains soft. With larger additions of the alloy a small percentage of titanium unites with the iron tending to harden it.

Whether the action of titanium is direct by alloying with the iron or indirect by the removal of gases the results show marked improvement in the iron. Test bars made from cast iron to which 1 to 5 per cent. of ferro-titanium (containing 10 to 12 per cent titanium) had been added showed an increased transverse strength up to 40 per cent. over bars made from iron receiving no titanium.

Vanadium, Nickel, &c.

Dr. Richard Moldenke lately made an important investigation upon the effect of vanadium on cast iron. The result of the experiments have been published in the *Transactions* of the American Foundrymen's Association, and showed an increase in transverse strength on test bars of gray iron from 2000 to 2500 lb., and white iron from 1500 to 3000 lb. These results were obtained by adding a few tenths per cent. of vanadium in the form of ferrovanadium, and also indicated that beneficial action could be obtained by so treating molten iron used to make chilled rolls and car wheels.

The action of nickel upon cast iron has been investigated by J. F. Webb and reported in the *Transactions* of the American Foundrymen's Association for 1907. It was found that the addition of between 0.5 and 7 per cent. nickel "showed no marked improvement in the physical strength of the casting."

Cast iron with 30 per cent. nickel is not easily corroded by water or exposure to the usual atmospheric conditions.

Chromium, tungsten and molybdenum alone or in ferroalloys have but little influence upon cast iron.

It is hoped that what has been stated in favor of certain alloys will not cause them to be taken as a panacea for all foundry troubles. When employed in an intelligent manner—that is, with a knowledge of the chemical composition of iron and of the alloy used—there is no doubt that ferroalloys will greatly assist the foundryman in the many and not too easy metallurgical problems with which he has to deal.

The Associated Supply Company, with general offices in the Wells-Fargo Building, San Francisco, has been incorporated under the laws of the State of California with a capital stock of \$500,000, fully paid. It proposes to operate stores at the present time in San Francisco; Los Angeles; Oil City, Kern County; McKittrick, Kern County; Coalinga, Fresno County; Los Alamos, Santa Barbara County, and will carry large stocks of all kinds of oil well tools and supplies, and to some extent stocks of general merchandise. Its large business, of course, will be in casing, tubing, merchant pipe, steel billets and blooms, steel bars, malleable and cast iron fittings, valves of all kinds and general hardware. The company desires catalogues and communications from such firms as have material to sell in which it is interested.

The plant of the Weber Bros. Foundry Company, Cincinnati, Ohio, was sold June 30 to Wessling Brothers of that city for \$15,000. The Webers failed last December, with liabilities given as \$44,000. Trustee C. H. Dornhoff of the Dornhoff & Joyce Company, conducted the sale and settlements, which were confirmed by the referee in bankruptcy. The Wesslings owned the foundry before the Webers, and acquire everything but the book accounts.

NEWS OF THE WORKS.

Iron and Steel.

The Shelby Steel Tube Company is cleaning up the wreckage of its plant at Shelby, Ohio, which was recently destroyed by fire, and it will be probably some months before the matter of rebuilding will be taken up.

The Youngstown Sheet & Tube Company, Youngstown, Ohio, is repairing its Alice Furnace at Sharpsville, Pa., and it may possibly be put in blast about August 1, but this has not been definitely decided upon as yet.

Belfont Furnace of the Belfont Iron Works Company, Iron-ton, Ohio, will be blown out in a couple of weeks.

Norton Furnace of the Norton Iron Works, Ashland, Ky., was blown out June 26.

General Machinery.

The John Hunsader Machine Company, Sturgeon Bay, Wis., having secured a site on the water front affording desirable dock facilities, has commenced the construction of a new plant, 50 x 80 ft., of cement blocks. The new plant will be equipped with machinery from the old plant.

The Ternaat & Monahan Company, Oshkosh, Wis., manufacturer of gasoline engines, has increased its capital stock to \$200,000 for the purpose of enlarging its capacity.

John Williams Taylor, Dallas, Texas, has incorporated his business under the name of the John Williams Taylor Company, with a capital stock of \$50,000. The company expects to add general heavy machinery to its business, which will include mill machinery and furnishings, railroad, mill, mine and elevator supplies, heating and ventilating systems. The incorporators are John W. Taylor, Eugene Bullock and John M. Thomas.

The Reliance Motor Truck Company, successor to the Reliance Motor Car Company, Detroit, Mich., is erecting a new plant at Owosso, 65 x 600 ft., with trussed steel roof and cement floor. The company is not yet in a position to state just how much additional machinery will be purchased for completing the equipment of the new building.

The Gibbs Gas Engine Company, Peters Building, Atlanta, Ga., recently organized, expects to complete plans for its proposed new plant in the latter part of July.

The William H. Ottemiller Company, York, Pa., has been organized with a capital stock of \$10,000, of which \$6500 has been paid in, to manufacture special screws and special machinery, to do general machine work and to sell machinery and supplies. G. Clayton Krone is president; William H. Ottemiller, treasurer and general manager, and J. H. Ottemiller, secretary.

Foundries.

The T. H. Symington Company, Corning, N. Y., which is to erect a new plant for the manufacture of journal boxes, lids, &c., to consist of a foundry, 400 x 700 ft., carpenter shop and pattern shop, will not build the plant at Elmira, N. Y., as stated in these columns last week. The company's plans are only preliminary and it does not yet know when or where the plant will be located, a number of points being under consideration.

Power Plant Equipment.

The installation of a water works system is being considered by the city of Russell, Kan. Plans and estimates have been prepared by Burns & McDonnell, Kansas City, Mo., and an election to decide the question of a bond issue to provide funds for this improvement will probably be held in the near future.

The City Clerk of Sturgeon Bay, Wis., will receive bids until July 7 for an electric light and water works plant. Bids will be received for constructing the plant complete and separate bids will be received for machinery and material delivered at Sturgeon Bay.

The Cannon Falls Electric Service Company, Cannon Falls, Minn., recently incorporated with a capital stock of \$25,000, will furnish commercial light and power, and deal in electric signs and specialties, electric fixtures and shades. The proprietors of the company are E. L. Twiss, L. F. Blinco, D. E. Twiss.

The city of Knox, Ind., has decided to construct a water works system to cost about \$18,000, plans and specifications for which are being prepared by Geo. C. Morgan, Royal Insurance Building, Chicago. H. C. Wise is City Clerk.

The Kirksville Light, Power & Ice Company, Kirksville, Mo., recently incorporated, has purchased the electric light and power plant formerly conducted by the Kirksville Electric Company, and is now constructing an ice plant, which it is expected will be ready for operation within 60 days. Charles V. Miller is president; C. J. Baxter, secretary.

The town of Holly, Colo., has under consideration the construction of a system of water works, for which an issue of bonds has been voted. Burns & McDonnell, Kansas City, Mo., have been selected as engineers for the supervision of the work.

The Athens Electric Railway Company, Athens, Ga., is increasing its power equipment by the installation of a 1000-kw. Allis-Chalmers turbine unit with Worthington condensers and additional battery of Sterling water tube boilers.

We are advised that an issue of \$24,000 in bonds has been

voted by the city of Russellville, Ala., for the construction of an electric light plant and water works system.

Bids for the installation of water works in the town of Templeton, Iowa, which were to have been received on June 6, have been extended to July 20. M. J. Daeges is Town Clerk.

A new power house will be added to the municipal electric light plant of Atlantic, Iowa, plans for which are being prepared by J. L. Darnell, Kansas City, Mo.

J. S. Beckwith, Machesney Building, Pittsburgh, Pa., has recently received a contract for a 260 hp. boiler to be installed by the Parker Boiler Company in the home of the Sister of the Good Shepherd, Wheeling, W. Va.

H. von Schon, Detroit, Mich., has been engaged to prepare plans and specifications for the hydro-electric development at Fremont, Ohio, which was deferred last year on account of the financial depression, and which is to be started at once. Three old mill powers have been consolidated, making 40 ft. head available which can be utilized at that point, and the works will consist of a spillway, power station, &c., the output to aggregate about 2000 hp.

Bridges and Buildings.

The Interstate Engineering Company, Bedford, Ohio, has been awarded the contract for the structural steel work for a new assembling and finishing building that is being erected by the Peerless Motor Car Company, Cleveland.

Fires.

The plant of the Columbia Heater Company, Belvidere, Ill., was totally destroyed by fire June 10, entailing a loss estimated at about \$50,000.

The power plant of the Portland Railway, Light & Power Company, at Cazadero, Ore., was burned June 21, the loss being about \$50,000.

The large abattoir of D. B. Martin & Co., Philadelphia, Pa., was destroyed by fire June 25, the loss being about \$50,000.

The plant of the Warren Refining Company, Warren, Pa., was burned June 24, the loss being about \$40,000.

Hardware.

The Chicago Nut Company, Chicago, Ill., has increased its capital stock from \$25,000 to \$40,000.

The Hill-Standard Mfg. Company, Anderson, Ind., maker of children's hand power vehicles, is considering the equipment of its plant with automatic sprinklers.

The Pelouze Scale & Mfg. Company, Chicago, Ill., has just moved into a new fireproof factory, which is said to be strictly modern and up to date in equipment and complete in all details.

Miscellaneous.

The contemplated building of a \$200,000 brick, concrete and steel packing plant adjacent to their present abattoir by E. H. Stanton & Co., Spokane, Wash., has been deferred and will not be undertaken until next year.

The New York Metal Ceiling Company, New York, has filed tentative plans for rebuilding its three-story factory building at 537-541 West Twenty-fourth street, New York, the intention being to add two new stories. It will probably be some weeks before the company decides upon the alterations, and at that time will know what new machinery it will have to install.

The Independent Stove Company, Detroit, Mich., has increased its capital stock to \$175,000.

The Circum Bearing Company, 123 Liberty street, New York, desires estimates from manufacturers upon parts of its circum bearings, stamped steel work, malleable and cast iron, semisteel, &c.

The Ideal Plating Company is now located in its new factory at Marlborough, Mass., where all communications should be sent.

Announcement is made of the formation of the Rockwell Furnace Company, 26 Cortlandt street, New York, engineer and manufacturer of metallurgical furnaces and fuel oil and gas burning appliances. The officers and employees of the company were connected for a number of years with the Rockwell Engineering Company, New York, and it is the intention of the new company to follow the high standard of excellence in furnace construction maintained by the latter company.

The city of Jamestown, N. D., is contemplating improvements to its water works and sewerage system, the cost of which is estimated at about \$10,000. Geo. Conn is engineer in charge.

The Wright Wire Company, Worcester, Mass., has purchased 35,000 sq. ft. of land across the street from its works at Worcester, and plans to erect a large fireproof storehouse on the premises. The work will not be done this season.

There is no truth in the current report that the Roach Shipbuilding Company, Chester, Pa., is to be sold to settle the estate of the late John B. Roach.

The new Ironton stack of the Ironton Iron Company, Ironton, Ohio, will go into blast about August 1 on foundry and malleable pig iron. The capacity is 200 tons a day. Quality and price will be identical with the Nellie product. Eaton, Rhodes & Co. will be one of the Cincinnati selling agents.

The Iron and Metal Trades

The Iron trade is drifting along without any special features. On the whole the volume of orders is a little larger and specifications are coming in slightly more freely, but little is expected of this, usually the duller season of the year.

Buying of Pig Iron is on a moderate scale, at about the range of prices which have been recently ruling, except that at least one large interest in the South is disposed to book business on the basis of \$11.50 for No. 2 Foundry at Birmingham. There have been some sales to Steel foundries on the Delaware of Low Phosphorus Pig at \$21 to \$21.25 delivered, the quantity involved being about 3000 tons. In Foundry Iron it is expected that there will be closed to-day an order for from 6000 to 8000 tons for a plant in New Jersey, and from 3000 to 4000 tons for a works in New England controlled by the same interest.

The mills have added a further belated moderate tonnage to their orders for Steel Bars, but that incident seems now to be practically closed. With the orders carried over from last year the season business entered for the agricultural implement makers and the vehicle builders has been quite satisfactory in volume.

The Plate mills report a slightly better run of work. Among the orders coming up is the material for the four new boats for the Quartermasters' Department just let to a yard on the Delaware.

The Erie Railroad has placed an order for 7500 tons of Steel Rails. The Seaboard order of 12,000 tons is simply a reinstatement of an old order, and the same is true of 8000 tons for the Tidewater Railroad. The latter, however, has added 2000 tons.

Little has been done in Structural Material. The impression is growing that the placing of contracts is being delayed pending a further reduction in the price. In the Chicago District the Western Electric Company is figuring on extensions which will call for about 15,000 tons.

There has come up again in the Merchant Pipe trade an inquiry for about 300 miles of 8-in. Pipe for the Pacific Coast. Generally speaking, while there has been a slight increase in business, there has not been a satisfactory response to the recent reduction in price.

A settlement has been reached on the wages scale for the year between the Amalgamated Association and the American Sheet & Tin Plate Company, which reduces Tin Plate wages about 5 per cent. in the union mills, which represent about 60 per cent. of the capacity.

Almost to a man, Copper mine managers boast of lowered costs through higher labor efficiency. Few of them admit a cost above 11c., and some claim 8c. and less. All are pushing output, and no one is holding the umbrella. Important new producers are swinging into line. Yet buyers are asked to believe that the tendency is upward when European consumers are supplied for months to come, encouraged by cheap money, and our home demand is only very slowly recovering. It looks as though the psychological moment for replenishing our own working stocks and covering coming wants well ahead had not yet come. When it does come a very large buying movement will set in with a sharp advance.

A Comparison of Prices.

Advances Over the Previous Month in Heavy Type,
Declines in Italics.

At date, one week, one month and one year previous.

	July 1, 1908.	June 24, 1908.	June 3, 1908.	July 3, 1907.
PIG IRON, Per Gross Ton:				
Foundry No. 2, Standard, Philadelphia.....	\$16.50	\$16.50	\$16.75	\$23.50
Foundry No. 2, Southern, Cincinnati.....	15.25	15.25	15.25	24.25
Foundry No. 2, Local, Chicago.....	17.50	17.50	17.25	25.50
Bessemer, Pittsburgh.....	16.90	16.90	16.90	24.15
Gray Forge, Pittsburgh.....	14.90	14.90	14.90	23.15
Lake Superior Charcoal, Chicago.....	20.00	20.00	20.00	27.00

BILLETS, &c., Per Gross Ton:

Bessemer Billets, Pittsburgh.....	25.00	25.00	28.00	30.00
Forging Billets, Pittsburgh.....	27.00	27.00	30.00	33.00
Open Hearth Billets, Phila.....	26.20	26.20	29.20	32.50
Wire Rods, Pittsburgh.....	33.00	33.00	35.00	36.50
Steel Rails, Heavy, Eastern Mill	28.00	28.00	28.00	28.00

OLD MATERIAL, Per Gross Ton:

Steel Rails, Melting, Chicago.....	12.50	12.50	12.25	18.75
Steel Rails, Melting, Phila.....	13.50	13.50	13.00	18.25
Iron Rails, Chicago.....	15.50	15.50	15.50	24.50
Iron Rails, Philadelphia.....	18.00	18.00	18.00	26.00
Car Wheels, Chicago.....	13.00	13.00	13.00	25.00
Car Wheels, Philadelphia.....	13.50	13.50	14.00	25.00
Heavy Steel Scrap, Pittsburgh.....	14.00	13.25	13.00	18.25
Heavy Steel Scrap, Chicago.....	11.50	11.50	11.50	16.50
Heavy Steel Scrap, Phila.....	13.50	13.50	13.00	18.00

FINISHED IRON AND STEEL,

Per Pound:	Cents.	Cents.	Cents.	Cents.
Refined Iron Bars, Philadelphia.....	1.35	1.40	1.40	1.83½
Common Iron Bars, Chicago.....	1.50	1.50	1.58	1.78
Common Iron Bars, Pittsburgh.....	1.40	1.40	1.50	1.70
Steel Bars, Tidewater, New York.....	1.56	1.56	1.76	1.86
Steel Bars, Pittsburgh.....	1.40	1.40	1.60	1.60
Tank Plates, Tidewater, New York.....	1.76	1.76	1.86	1.86
Tank Plates, Pittsburgh.....	1.60	1.60	1.70	1.70
Beams, Tidewater, New York.....	1.76	1.76	1.86	1.86
Beams, Pittsburgh.....	1.60	1.60	1.70	1.70
Angles, Tidewater, New York.....	1.76	1.76	1.86	1.86
Angles, Pittsburgh.....	1.60	1.60	1.70	1.70
Skelp, Grooved Steel, Pittsburgh.....	1.45	1.45	1.55	1.90
Skelp, Sheared Steel, Pittsburgh.....	1.50	1.50	1.65	1.90

SHEETS, NAILS AND WIRE,

Per Pound:	Cents.	Cents.	Cents.	Cents.
Sheets, No. 27, Pittsburgh.....	2.40	2.40	2.40	2.50
Wire Nails, Pittsburgh.....	1.95	1.95	2.05	2.00
Cut Nails, Pittsburgh.....	1.75	1.75	1.85	2.05
Barb Wire, Galv., Pittsburgh.....	2.40	2.40	2.50	2.45

METALS, Per Pound:

	Cents.	Cents.	Cents.	Cents.
Lake Copper, New York.....	12.87½	13.00	13.00	23.50
Electrolytic Copper, New York.....	12.62½	12.87½	12.62½	22.00
Spelter, New York.....	4.50	4.55	4.55	6.35
Spelter, St. Louis.....	4.35	4.40	4.40	6.27½
Lead, New York.....	4.50	4.50	4.30	5.25
Lead, St. Louis.....	4.40	4.40	4.20	5.15
Tin, New York.....	27.20	27.60	28.85	42.75
Antimony, Hallett, New York.....	8.25	8.50	8.50	12.00
Nickel, New York.....	45.00	45.00	45.00	45.00
Tin Plate, 100 lb., New York.....	\$3.89	\$3.89	\$3.89	\$4.09

Chicago.

FISHER BUILDING, July 1, 1908.—(By Telegraph.)

Steel Bars and Wire products are the only divisions of the finished material market in which there is any movement of special interest. Some hesitating contracts for Steel Bars closed during the week added 20,000 tons to the tonnage taken by implement makers. There has also been some increase in specifications from the same source, but improvement in this respect is only moderate, though the greater frequency of demand for prompt shipment indicates the existence of stock shortages. The fact also that production will be much reduced through July by the shutdown of a number of Bar mills is doubtless responsible for part of the increase noted. Responsive to the actual needs of consumption, Wire products are in fairly good demand. Though it is recognized from the character of purchases that buyers are not anticipating wants far in advance, last week's bookings of new business and specifications by the principal interest ran well up to a normal midseason average. This result, however, is only significant of sound agricultural conditions and is not regarded as a forerunner of an early quickening of trade. Such improvement as is shown in Sheets, Plates and Merchant Pipe is of no particular moment except in so far as it indicates a forward rather than a backward tendency. While there is no activity in Rails, there is evidence that a good many interurban projects brought out last year and since held up by adverse financial and industrial conditions have not been abandoned and are only awaiting developments favorable to their consumma-

tion. Prices in finished material show a remarkable degree of steadiness and uniformity considering the quiet state of demand. Very little unevenness has developed, though it is true there is not enough business coming out to test the market severely in any line. The recent support afforded to the Scrap market by a heavy demand for Re-rolling Steel Rails has been withdrawn, and in consequence prices are easier though not as yet appreciably reduced.

Pig Iron.—Transactions for the week are somewhat less in volume than in the week previous, though the character of the demand is unchanged. The majority of orders are for small lots, with a few sales mainly of Northern Iron running as high as 1000 tons. Included in these are one of 1000 tons of Malleable Bessemer sold by a leading Northern furnace at \$17.50, and another of 1000 tons of Silicon Iron. As was the case a week ago, there was more demand for Northern than for Southern Iron, with the implement foundries more active as buyers than the jobbing melters. The position of both Northern and Southern furnaces respecting prices remains unchanged, with \$17.50 at furnace for the former and \$12, Birmingham, for the latter as the recognized market levels. Valley Irons continue to be openly offered on a basis of \$15, at furnace, or \$17.40, Chicago, so that in open competition the local price of \$17.50 at furnace is necessarily subject to concession. A large part of the transactions in Northern Iron is, however, comprised of standard brands on which more than a nominal shade in price is necessary to influence buyers. A prominent implement manufacturer is still in the market for a moderate tonnage, most of which is required for early delivery. A few makers seem to be willing to go as low as \$11.50, Birmingham, on orders for prompt shipment, and it is likely that some Iron is still available at this price. In other respects the market shows an encouraging degree of firmness, which lacks only a decided increase in the melt in jobbing foundries to guarantee its position. The following prices are for July, August and September delivery, f.o.b. Chicago:

Lake Superior Charcoal.....	\$20.00 to \$20.50
Northern Coke Foundry, No. 1.....	18.00 to 18.50
Northern Coke Foundry, No. 2.....	17.50 to 18.00
Northern Coke Foundry, No. 3.....	17.00 to 17.50
Northern Scotch, No. 1.....	18.50 to 19.00
Southern Coke, No. 1.....	16.85 to 17.35
Southern Coke, No. 2.....	16.35 to 16.85
Southern Coke, No. 3.....	15.85 to 16.35
Southern Coke, No. 4.....	15.35 to 15.85
Southern Coke, No. 1 Soft.....	16.85 to 17.35
Southern Coke, No. 2 Soft.....	16.35 to 16.85
Southern Gray Forge.....	14.35 to 14.85
Southern Mottled.....	14.10 to 14.60
Malleable Bessemer.....	17.50 to 18.00
Standard Bessemer.....	18.40 to 18.90
Jackson Co. and Kentucky Silvery, 6 %	19.90 to 20.40
Jackson Co. and Kentucky Silvery, 8 %	20.90 to 21.40
Jackson Co. and Kentucky Silvery, 10 %	22.90 to 23.40

(By Mail.)

Billets and Rods.—Practically no new business is being offered in Steel. Orders for Forging Billets comprise lots of car lots and less, and even these are few and far between. No deviation from the regular price is heard of, which for Rolling Billets is \$28.50, base, Chicago. The situation in Wire Rods is not materially changed. Specifications are coming in at a fairly good rate, but the tonnage of new contracts is moderate. We quote as follows: Bessemer, \$33; Basic, \$34, all at Pittsburgh.

Rails and Track Supplies.—The events of the past week have included nothing of market interest in Rails of any kind. No orders so far as reported have been placed nor are any inquiries out that give promise of early developments. Moderate orders are being entered for Track Supplies, though business in this direction does not reflect a marked increase in railroad demand. Neither is the tonnage of new business in Light Rails increasing, though it is holding pretty nearly the average of recent weeks. The conditions as to prices of Light Rails are unchanged, concessions of from \$3 to \$5 a ton being made by re-rolling mills. We quote as follows: Angle Bars, accompanying Rail orders, 1908 delivery, 1.50c.; car lots, 1.60c.; Spikes, 1.80c. to 1.90c., according to delivery; Track Bolts, 2.20c. to 2.25c., base, Square Nuts, and 2.35c. to 2.40c., base, Hexagonal Nuts. The store prices on Track Supplies range from 0.15c. to 0.20c. above mill prices. Light Rails, 25 to 45 lb., \$28; 20-lb., \$29; 16-lb., \$30; 12-lb., \$31. Standard Sections, \$28, f.o.b. mill, full freight to destination.

Structural Material.—Quite a number of Structural projects on which bids are in, and on which early closure was expected by fabricators, are being held up. No reason is assigned for the delay other than that the conjecture that buyers are hoping for a further recession in prices. Most of the projects involved are of a character that seems to assure final consummation, as is indicated by the persistent efforts made to secure revised proposals from fabricators. Among the contracts taken in the past week none is of noteworthy tonnage. The most important undertaking involving the use of Structural Material now in sight is that of the additional plant buildings which the Western Electric Company is about to erect; for the completion of extensions planned, about 15,000 tons will be required. Bids are now being taken on 500 tons for the initial building, and con-

tracts for this portion will likely be placed within a week. Inquiries are out for about 2500 tons of bridge material, of which at least 500 tons will doubtless be let without delay. Slight improvement is noted in specifications coming to the mills, but the increase is not yet sufficient to warrant starting the Structural mills at the South Works, which have been idle several weeks. Prices from store at 1.95c. to 2c. Mill prices at Chicago are as follows: Beams and Channels, 3 to 15 in., inclusive, 1.78c.; Angles, 3 to 6 in., 1/4-in. and heavier, 1.78c.; larger than 6 in. on one or both legs, 1.88c.; Beams, larger than 6 in. on one or both legs, 1.88c.; Beams, larger than 15 in., 1.88c.; Zees, 3 in. and over, 1.78c.; Tees, 3 in. and over, 1.83c., in addition to the usual extras.

Plates.—Orders for small lots continue to represent all that is doing in the way of new business. These, however, have been a little more numerous in the past 10 days; but until the large users of Plates, such as car shops, ship yards and tank and boiler shops, are better supplied with work there will be a scarcity of large orders. The Sheared Plate mill at the South Works was started on Monday of this week to clean up specifications that have been gradually piling up during a number of weeks the mill has been idle. The Universal mill remains closed. Leading producers report prices as being firmly maintained, with the exception of occasional concessions of about \$1 a ton being made on small Plates by the smaller mills. We quote mill shipments, as follows: Tank Plates, 1/4-in. and heavier, wider than 6 1/4 and up to 100 in. wide, inclusive, car lots, Chicago, 1.78c.; 3-16 in., 1.88c.; Nos. 7 and 8 gauge, 1.93c.; No. 9, 2.03c.; Flange quality, in widths up to 100 in., 1.88c., base, for 1/4-in. and heavier, with the same advance for lighter weights; Sketch Plates, Tank quality, 1.88c.; Flange quality, 1.98c. Store prices on Plates are as follows: Tank Plates, 1/4-in. and heavier up to 72-in. wide, 2c. to 2.10c.; from 72 to 96 in. wide, 2.10c. to 2.20c.; 3-16 in. up to 60 in. wide, 2.10c. to 2.25c.; 72 in. wide, 2.30c. to 2.40c.; No. 8, up to 60 in. wide, 2.10c. to 2.15c.; Flange and Head quality, 0.25c. extra.

Sheets.—Trade in Sheets continues quiet, being closely restricted to actual consumptive requirements. Stock orders from jobbers contain specifications for actual replenishment needs only, there being no disposition in any quarter to buy ahead. Store stocks are moving slowly, especially in the heavy gauges. Except for a shade of \$1 a ton obtainable from a few of the smaller mills, prices are reported to be firmly maintained. We quote mill shipments, as follows, Chicago: Blue Annealed, No. 10, 1.98c.; No. 12, 2.05c.; No. 14, 2.08c.; No. 16, 2.18c.; Box Annealed, Nos. 17 to 21, 2.43c.; Nos. 22 to 24, 2.48c.; Nos. 25 and 26, 2.53c.; No. 27, 2.58c.; No. 28, 2.68c.; No. 29, 2.78c.; No. 30, 2.88c.; Galvanized Sheets, Nos. 10 to 14, 2.63c.; Nos. 15 and 16, 2.83c.; Nos. 17 to 21, 2.98c.; Nos. 22 to 24, 3.13c.; Nos. 25 and 26, 3.33c.; No. 27, 3.53c.; No. 28, 3.73c.; No. 30, 4.23c.; Black Sheets from store: Blue Annealed, No. 10, 2.20c.; No. 12, 2.25c.; No. 14, 2.30c.; No. 16, 2.40c.; Box Annealed, Nos. 18 to 21, 2.60c.; Nos. 22 to 24, 2.65c.; No. 26, 2.70c.; No. 27, 2.75c.; No. 28, 2.85c.; No. 30, 3.25c.; Galvanized from store: Nos. 10 to 16, 3c.; Nos. 18 to 20, 3.15c.; Nos. 22 to 24, 3.30c.; No. 26, 3.50c.; No. 27, 3.70c.; No. 28, 3.90c.; No. 30, 4.40c. to 4.45c.

Bars.—A number of contracts for Steel Bars pending since the recent price reduction have been entered during the week. Of such business 20,000 tons was booked by the leading interest which swells its total to 60,000 tons. What is of perhaps greater significance is that specifications are being offered more freely. Steel stocks in the hands of implement makers have been steadily reduced without replenishment for some time, and it is noted that specifications are now generally being accompanied by requests for prompt shipment. This lends encouragement to the hope that the rolling schedules of the Bar mills will soon be better filled, enabling their steadier operation. All of the Bar mills of the Illinois Steel Company's Bay View plant are going, with prospect of continuance throughout the week. With the various plants of the Republic Iron & Steel Company closed down during July, and some others that will be idle through a part or all of this period, the remaining mill capacity of the district will doubtless be more fully occupied. It is stoutly affirmed by local producers that the new schedule of prices on Iron and Steel Bars is being rigidly maintained. Quotations, Chicago, are as follows: Steel Bars, 1.58c., with half extras; Iron Bars, 1.50c.; Hoops, No. 13 and lighter, 1.98c., full extra Hoop card; Bands, No. 12 gauge and heavier, 1.58c., half extra Steel Bar card; Soft Steel Angles and Shapes, 1.68c., half extras. Store prices are as follows: Bar Iron, 2c. to 2.15c.; Steel Bars, 1.90c. to 2c.; Steel Bands, 1.90c., as per Bar card, half extras; Soft Steel Hoops, 2.25c. to 2.35c., full extras.

Merchant Pipe.—While the demand for Merchant Pipe shows a slight increase, it is not regarded as a satisfactory response to the concession made in the recent reduction of \$4 a ton. Though jobbers' orders are of somewhat better volume, what increase there is seems to correspond closely to increase in consumption. In other words, jobbers are not enlarging their stocks, which are being held down as nearly as

possible to the minimum of present trade requirements. Out of the territory tributary to this market, more is coming from the Northwest than any other section, due doubtless to the promising crop outlook. The following mill discounts are quoted: Black Pipe, $\frac{3}{4}$ to 6 in., 73.2; 7 to 12 in., 70.2; Galvanized, $\frac{3}{4}$ to 6 in., 63.2. These discounts are subject to one point on the base. From store, in small lots, Chicago jobbers quote 73 per cent. on Black Steel Pipe, $\frac{3}{4}$ to 6 in. About three points above these prices is asked for Iron Pipe.

Boiler Tubes.—Better inquiry for Locomotive Tubes is regarded as foreshadowing more liberal purchases by the railroads. As yet these have not resulted in actual orders, but reports of active repair work on motive power equipment to be undertaken soon find some measure of confirmation in collateral conditions. The demand for Merchant Tubes is still extremely quiet. Mill quotations for future delivery, on the base sizes, are as follows: Steel Tubes, 63.2; Iron, 50.2; Seamless, 49.2; $2\frac{1}{2}$ in. and smaller, and lengths over 18 ft., and $2\frac{1}{2}$ in. and larger, and lengths over 22 ft., 10 per cent. extra. Store prices are as follows:

	Steel.	Iron.	Seamless.
1 to $1\frac{1}{4}$ in.....	35	35	35
$1\frac{1}{4}$ to $2\frac{1}{4}$ in.....	50	35	35
$2\frac{1}{4}$ in.....	52½	35	35
$2\frac{1}{2}$ to 5 in.....	60	47½	47½
6 in. and larger.....	50	35	..

Merchant Steel.—A fair tonnage in contracts for miscellaneous Shapes has been taken by implement makers in the past week. Specifications, however, have not yet commenced to come out in any volume. Orders for Tire sizes from wagon builders have been more plentiful, and with the exception of Shafting, perhaps, all lines included under this head are in better demand. Quotations are as follows: Planished or Smooth Finished Tire Steel, 1.78c.; Iron Finish up to $1\frac{1}{2}$ x $\frac{1}{2}$ in., 1.73c., base, Steel card; Iron Finish, $1\frac{1}{2}$ x $\frac{1}{2}$ in. and larger, 1.58c., base, Tire card; Channels for solid Rubber Tires, $\frac{3}{4}$ to 1 in., 2.08c., and $1\frac{1}{4}$ in. and larger, 1.98c.; Smooth Finished Machinery Steel, 2.08c.; Flat Sleigh Shoe, 1.63c.; Concave and Convex Sleigh Shoe, 1.83c.; Cutter Shoe, 2.05c.; Toe Calk Steel, 2.13c.; Railroad Spring, 1.98c.; Crucible Tool Steel, $\frac{7}{8}$ in. to 8c., and still higher prices are asked on special grades. Shafting, 56 per cent. off in car lots; 52 per cent. in less than car lots, base territory delivery.

Cast Iron Pipe.—A contract for 1800 tons of 6-in. and 8-in. Pipe let last week by the city of Newark, Ohio, was awarded to James B. Clow & Son. Bids on 1000 tons up for letter by Berwyn, Ill., were opened, but the contract has not yet been awarded; offers from contractors only were considered. The total volume of business moving is not great enough to reduce stocks in foundry yards, which have in most cases been steadily accumulating. Although there are but few lots of considerable tonnage being let, the aggregate of small routine orders holds fairly even. Miscellaneous orders for Gas Pipe amounting to 1500 tons were booked by the United States Cast Iron Pipe & Foundry Company. We quote, nominally, per net ton, Chicago, as follows: Water Pipe, 4-in., \$27; 6 to 12 in., \$26; 16-in. and up, \$25; with \$1 extra for Gas Pipe.

Metals.—There are but few carload buyers for Copper or other metals in the market, the majority of consumers preferring to supply their needs with 5 to 10 ton lots. Dealers report that metal using shops are slowly increasing their output, but are buying very little more material. In no quarter is there any disposition shown to contract for future deliveries, nor is it expected that this disposition will change until either business improves or prices show a tendency to advance. Values hold practically without change throughout the line, though Lead is somewhat less firm at the ruling quotation. We quote, as follows: Casting Copper, 13¼c.; Lake, 13¼c. to 13¾c., in car lots for prompt shipment; small lots, ¼c. to ¾c. higher; Pig Tin, car lots, 30c.; small lots, 32¼c.; Lead, Desilverized, 4.60c. to 4.65c., for 50-ton lots; Corroding, 4.95c. to 5.05c., for 50-ton lots; in car lots, 2¼c. per 100 lb. higher; Spelter, 5c.; Cookson's Antimony, 10¼c., and other grades, 9¼c. to 10¼c.; Sheet Zinc is \$7, list, f.o.b. La Salle, in car lots of 600-lb. casks. On Old Metals we quote: Copper Wire, 12¼c.; Heavy Copper, 12¼c.; Copper Bottoms, 10½c.; Copper Clips, 11c.; Red Brass, 11¼c.; Yellow Brass, 9¼c.; Light Brass, 6¼c.; Lead Pipe, 4c.; Zinc, 3¼c.; Pewter, No. 1, 21c.; Tin Foil, 24c.; Block Tin Pipe, 27c.

Old Material.—Outside of trading among dealers, which is less active than a week ago, there is little doing in the market; but with the closure of a number of rolling mills in this district in July, and others running at only part capacity, there is little prospect of much demand for mill material. Melters, on the other hand, are not actively in the market, most of them restricting purchases to actual needs. There is no material change in prices, though it is more difficult for sellers to place material at figures within the range of current quotations than it was a week ago. There is some demand for Re-rolling Steel Rails, but buyers are not paying outside prices, as has been the case for several weeks. A lot of 600 tons of 60-lb. Relaying Rails offered by the Chicago, Indiana & Southern Railway brought

\$19.50. Other railroad material closed since last report included 1000 tons by the Chicago, Milwaukee & St. Paul, and 3000 tons by the Chicago, Burlington & Quincy. A list of 2100 tons will be offered by the Chicago & Northwestern this week. We quote per gross ton, f.o.b. Chicago, as follows:

Old Iron Rails.....	\$15.50 to \$16.00
Old Steel Rails, re-rolling.....	14.25 to 14.75
Old Steel Rails, less than 3 ft.....	12.50 to 13.00
Relaying Rails, standard sections, subject to inspection.....	19.00 to 20.00
Old Car Wheels.....	13.00 to 13.50
Heavy Melting Steel Scrap.....	11.50 to 12.00
Frogs, Switches and Guards, cut apart.....	12.00 to 12.50
Mixed Steel.....	9.50 to 10.00

The following quotations are per net ton:

Iron Fish Plates.....	\$14.25 to \$14.75
Iron Car Axles.....	16.50 to 17.00
Steel Car Axles.....	15.25 to 15.75
No. 1 Railroad Wrought.....	12.00 to 12.50
No. 2 Railroad Wrought.....	11.00 to 11.50
Railway Springs.....	11.75 to 12.25
Locomotive Tires, smooth.....	12.75 to 13.25
No. 1 Dealers' Forge.....	9.50 to 10.00
Mixed Busheling.....	7.00 to 7.50
Iron Axle Turnings.....	6.00 to 6.50
Soft Steel Axle Turnings.....	6.00 to 6.50
Machine Shop Turnings.....	6.00 to 6.50
Cast Borings.....	5.00 to 5.50
Mixed Borings, &c.....	5.00 to 5.50
No. 1 Mill.....	6.50 to 7.00
No. 2 Mill.....	5.50 to 6.00
No. 1 Rollers, cut to Sheets and Rings.....	8.25 to 8.75
No. 1 Cast Scrap.....	12.25 to 12.75
Stove Plate and Light Cast Scrap.....	10.25 to 10.75
Railroad Malleable.....	11.25 to 11.75
Agricultural Malleable.....	10.25 to 10.75
Pipes and Flues.....	8.00 to 8.50

San Francisco.

SAN FRANCISCO, CAL., June 24, 1908.

On the whole the situation in Iron and Steel lines is more favorable, although the reductions in mill prices have not particularly stimulated buying here. Collections are good again and what business is transacted is done on a safe basis. Several large contracts have been let for Government work and others are coming up in the not far future. The Union Iron Works will soon award contracts for material for the early construction of a floating dry dock capable of handling a vessel 500 ft. in length. It will be constructed in two sections and will be by far the largest floating dock on the Pacific Coast. The building of new mining mills is progressing in this State and other portions of the Coast and several new smelters are talked of. More smelters are now in operation and others will resume work later. The State Harbor Commissioners have approved the plans for pier 40, which is to be constructed on the site of the old Pacific Mail dock. It will be fireproof. Instead of piles, pillars of concrete reinforced with Steel will support the dock. A concrete floor will rest on Steel beams and the shed will be of Steel. The wharf will be 130 x 650 ft., and the cost estimates run from \$375,000 to \$412,000. A letter of award has just arrived from Washington containing the details in regard to the transport wharves which are to be constructed for the new army supply depot at Fort Mason, San Francisco. The work must be completed within 27 months, and two sections of sea wall, the first part of the construction work, within six months. These aggregate 1200 ft. Much Structural Steel will be required for the wharves and sheds. Some reinforced concrete work will be included. The cost of the wharves, with their sheds, will be \$1,178,000.

Structural Material.—While many new buildings are in plan, the tightness of money still delays the closing of contracts for Structural Steel on several large business buildings. Specifications are out for the new Magnin Building which will require 300 tons or more. Some bridge Steel will be required for several good contracts coming up in July in the interior of the State. The revised plans for the fine hotel which is to be erected on the block at the corner of Fourteenth and Harrison streets, in Oakland, have been sent out from the East and the details will soon be given out for contractors to figure upon. The reinforced concrete foundations have been completed and it is the intention to commence work on the five-story superstructure as soon as practicable. The entire investment will amount to about \$2,000,000. State Architect Sellon has prepared plans for the State building which is to be erected in San Francisco. It will be a seven-story Steel frame building, occupying a space of 100 x 120 ft., in a central location. Space is provided for many State offices, including those of the Bank Commission, Railroad Commission, Supreme Court, District Court of Appeals and Board of Health.

Pig Iron.—The local consumption of Pig Iron is still comparatively light, but prices have not declined to any extent as a result of the recent drop in price of Iron Ore in the East. Buying continues light and mainly for immediate use. Stocks of foreign Pig Iron have been increased by the arrival of the ship Milverton with 300 tons of Pig Iron from Antwerp and the steamer Admiral Dupree with 525 tons of

Chinese Pig Iron loaded at Shanghai. The foundry business remains dull, as the mining and shipbuilding companies are not sending in many orders for castings. Prices of No. 1 Scotch, No. 1 English and Chinese Pig Iron are about \$28 per ton, ex-yard, San Francisco.

Merchant Pipe.—While stocks are reduced to a low ebb, there is not much of a demand for Merchant Pipe at present. Occasionally an order has to be sent East by wire, owing to a shortage in some particular size. It seems that considerable buying by the local jobbers will be absolutely necessary before long, for otherwise their assortments will get badly broken. Discounts on Steel Pipe are about as follows on jobbers' carloads:

	Steel.	
	Black.	Galv.
1/8 to 3/4 in.	56.5	40.5
3/8 in.	58.5	44.5
1/2 in.	60.5	48.5
3/4 to 6 in.	64.5	54.5
7/8 to 12 in.	61.5	46.5
Extra strong, plain ends:		
1/8 to 3/4 in.	49.5	37.5
1/2 to 4 in.	56.5	44.5
4 1/2 to 8 in.	52.5	40.5
Double extra strong, plain ends:		
1/2 to 8 in.	45.5	34.5

Cast Iron Pipe.—Reports for the past week are without transactions of significance, but the outlook is encouraging. There are numerous inquiries for small lots of Pipe for delivery during the next three months. The city of Chico, Cal., has taken bids for Cast Iron Pipe for a municipal street sprinkling system. The Oro Water, Light & Power Company, which supplies the city of Oroville, has agreed to improve the service so that there will be enough water for sprinkling. The city will be repiped. The new City Gas Company of Los Angeles is in the market for a quantity of Pipe for its extensions. The United States Cast Iron Pipe & Foundry Company, R. W. Martindale, Pacific Coast sales manager, has taken a \$12,000 contract to furnish a lot of special castings, including some 60-in. tees, bends, &c., for the new Government dry dock which is being completed by the Scofield Construction Company at the Mare Island Navy Yard. The Coast market on Cast Iron Pipe remains firm at about the following prices: 6, 8, 10 and 12 in., \$36; 4-in., \$37, f.o.b. Pacific Coast terminals.

Coke.—The market for Coke is perhaps a little stronger, with a slight improvement expected in the demand from the smelters, but without any advance in prices so far. The only arrival of Coke of any consequence in many weeks was a shipment of 600 tons of Westphalian Coke, per ship Milverton, which arrived June 11 from Antwerp. Notwithstanding the lack of importations of Coke, stocks are still in excess of the present needs of the Pacific Coast. The closing of the Selby Smelting & Lead Company's large smelter at Selby, Contra Costa County, temporarily, has reduced that company's requirements for Coke, which amount to a large quantity annually.

Major Williamson, the constructing quartermaster, has received 21 bids for the work of installing a pumping plant at the Presidio of San Francisco. The estimated cost of the new water system is about \$100,000. It is almost certain that several different contractors will have portions of the work, as no one firm submitted the lowest bid for all seven divisions of the project.

The trial of C. W. French, the Steel plant promoter charged with obtaining \$1000 from C. H. Geldert of San Jose under false pretenses, which was set for June 22, has been put over until July 13, owing to the enforced absence of a witness for the State. Mr. French was the organizer of the Pacific Steel Company, a corporation of San Diego, Cal., capitalized at \$1,000,000. Harrison Gray Otis is the president of the company and Ulysses S. Grant one of the directors, and both are stated to have lost heavily through the connection.

The plans for the improvement of Oakland's water front, which are being prepared by the Board of Public Works, will be presented to the Oakland City Council July 6. The plans provide for an expenditure of about \$25,000,000 in the improvement of the water front. The proposed improvements will be carried out in sections, and it is expected that within the next six months a bond election will be called to secure funds with which to do a portion of the proposed work. The plans are very comprehensive, and provide for the building of municipal docks and wharves on Oakland's entire water front. Three railroad companies already have four long piers with a ferry depot at the end of each on the water front. The Western Pacific Railway, which is nearly completed from Salt Lake City to Oakland, has just finished its passenger and freight ferry slips.

The Canadian Pacific Railway has placed an order for 20 locomotives with the Canadian works of the American Locomotive Company, at Montreal, delivery to be made at the rate of five a week.

Philadelphia.

PHILADELPHIA, PA., June 30, 1908.

A noticeable decline is observed in buying, as is customarily the case about this time. The closing week in June and the opening week in July are usually dull, owing to the fact that many manufacturing consumers are engaged in semiannual stock taking and mills to a large extent close down for the usual summer repairs. The falling off in business is therefore not looked upon with any degree of apprehension. The undertone of the market is strong, notwithstanding the fact that here and there a weak spot has developed, and the belief is expressed that after the nomination of the candidate for President by the Democratic convention next week, business will again move forward, and continue to show a moderate, steady gain. It is also believed that the railroads will enter the market before long, as with the present favorable outlook for harvest they will find it necessary to place a large part of their equipment in shape to enable them to move the crops expeditiously.

Pig Iron.—While some sellers still report pretty large sales, the aggregate tonnage sold in the past week shows a decline. Transactions have been pretty largely confined to Foundry grades, quantities running from car loads up to several hundred tons, with an isolated sale of a 1000 ton lot. There is considerable inquiry for Iron for last half and last quarter delivery, but sellers are not forcing the market, and for standard grades the ruling prices prevail. Some few would probably make a slight concession for prompt shipment, particularly where stocks on hand are large, but stocks on furnace banks generally are reported to be rapidly diminishing, so that this situation is likely to adjust itself in the near future, particularly inasmuch as those furnaces which have made concessions heretofore are firm on their prices for forward shipment. Eastern Pennsylvania furnaces are holding at \$16 at furnace for standard No. 2X Irons, equal to \$16.50 to \$16.75 delivered for third quarter, while for fourth quarter \$16.75 to \$17, delivered, is quoted for the same grade, although if the tonnage was satisfactory \$16.50 to \$16.75 might be done for deliveries to extend over the full last half of the year. The Pipe makers have been in the market and sales of moderate tonnages of both standard and low grade Irons are reported. No concessions are said to have been made in the standard Foundry grades, although it is understood that the low grade Irons were bought at quite low figures. Virginia Foundry Irons have not been active. Some sales of Nos. 2X and 2 Plain have been reported at the ruling prices for local delivery, while some off grade Irons have been sold to the Pipe makers. Southern Iron has not been extensively sold. The reported weakness on the part of a few sellers has held up buying for the time in order to see what will develop. The large majority of sellers, however, are very firm regarding price, and no business of any volume has been done even at the reported lower figures. Forge Iron is in but light demand, the Bar mills still running irregularly. Basis Iron has been dull, recent sales having covered about all that consumers will take at the time, although one buyer is said to be still in the market for a moderate tonnage for last half delivery. Some little business has been done in Low Phosphorus Iron, the aggregate sales during the week reaching about 3000 tons, at prices ranging from \$21 to \$21.25, delivered. Quotations for third quarter delivery are practically unchanged. For the fourth quarter, the majority of sellers ask an advance of 50c. a ton, although the outside price quoted for third quarter can be done for deliveries covering the last half of the year. For delivery in buyers' yards eastern Pennsylvania and nearby territory, during the third quarter, quotations range as follows:

Eastern Pennsylvania, No. 2 X Foundry.	\$16.50 to \$16.75
Eastern Pennsylvania, No. 2 Plain.	16.00 to 16.25
Virginia, No. 2 X Foundry.	17.00
Virginia, No. 2 Plain.	16.50 to 16.75
Gray Forge.	15.00 to 15.50
Basic.	15.25 to 15.50
Low Phosphorus.	21.00 to 21.25

Ferromanganese.—Prices are lower, due no doubt to the lack of interest shown by buyers at the recent price level. The demand is very light, but one sale of 150 tons for Western delivery having been made at \$43, Baltimore. For prompt shipment we quote \$43 to \$44, Baltimore.

Steel.—The demand is not large, orders being confined to small lots for prompt delivery. There is no disposition shown on the part of buyers to anticipate their requirements. Prices are unchanged, ordinary Rolling Steel being quoted for delivery in this district at \$26.20, with Forging Steel at \$28.20, subject to the usual extras for high carbons and special sizes.

Plates.—Decided improvement is to be noted in the demand for Plates. Tonnages placed are running larger, and Plate makers are more encouraged with the outlook for the future. Good orders have recently been booked for boat, tank, bridge and locomotive Steel. Some pretty fair tonnages are being inquired for. One of the propositions still to come out is for the Steel for the construction of four new boats for the Quartermaster's Department, U. S. N., the contract

to build which was awarded a few days ago to the New York Shipbuilding Company, Camden, N. J. Quotations are being firmly held, although some concessions are said to have been made by the smaller mills which are not factors in the trade. The leading mills quote as follows for local delivery:

	Carloads.	Parts carload.
	Cents.	Cents.
Tank, Bridge and Boat Steel.....	1.75	1.80
Flange or Boiler Steel.....	1.85	1.95
Commercial Firebox.....	1.95	2.00
Marine.....	2.15	2.20
Locomotive Firebox Steel.....	2.25	2.30
The above are base prices for 1/4-in. and heavier. Ing extras apply:		
3-16-in. thick.....	\$0.10	
Nos. 7 and 8, B. W. G.....	.15	
No. 9, B. W. G.....	.25	
Plates over 100 to 110 in.....	.05	
Plates over 110 to 115 in.....	.10	
Plates over 115 to 120 in.....	.15	
Plates over 120 to 125 in.....	.25	
Plates over 125 to 130 in.....	.50	
Plates over 130 in.....	1.00	

Structural Material.—The business placed recently has been confined to small tonnages. Large propositions continue to be held in abeyance, while considerable work of moderate size, particularly in the building line, is being estimated upon. Mills continue to book about an average volume of business, made up largely of orders of a miscellaneous character. Prices are unchanged, 1.75c. to 1.90c., according to specifications, being quoted for deliveries in this territory.

Sheets.—The demand has not been so good for Sheets, and some of the mills again show a falling off in production. A number of the mills have shut down during the week for the usual midsummer overhauling, and will probably remain idle for several weeks. This, however, will depend on the volume of new orders received. Quotations are firm and unchanged, and range as follows for mill shipments, a tenth extra being added for small lots: Nos. 18 to 20, 2.50c.; Nos. 22 to 24, 2.60c.; Nos. 25 to 26, 2.70c.; No. 27, 2.80c.; No. 28, 2.90c.

Bars.—A better demand is to be noted. Consumers are inclined to contract for future needs at the present low prices, but mills as a rule refuse to take orders for forward delivery at prompt delivery prices. Specifications are better, and there is more tonnage coming to the mills. Prices show a further recession, and Iron Bars can now be had at 1.35c. to 1.45c., delivered, in this territory. Steel Bars are in moderate demand, and are quoted at 1.55c., with Re-rolled Bars at 1.50c., delivered in this territory.

Coke.—A fair demand is to be noted for Foundry Coke. Not much business has been done in Furnace Coke. A few contracts for delivery in the last half have been made, but the aggregate tonnage sold was not large. Prices are unchanged, Foundry Coke being quoted at \$2.15 to \$2.35, with Furnace Coke at \$1.50 to \$1.75, at oven. For delivery in this territory the following range of prices is quoted:

Connellsville Furnace Coke.....	\$3.65 to \$3.90
Foundry Coke.....	4.50 to 4.50
Mountain Furnace Coke.....	3.25 to 3.50
Foundry Coke.....	3.90 to 4.10

Old Material.—While there has not been much business done, the undertone of the market is somewhat better. The rolling mills have been taking better tonnages of No. 1 Wrought Iron, Borings and Turnings, but there is no quotable change in the price of these materials. Heavy Melting Steel is being inquired for, but no tonnage of any size has yet been taken. In the absence of business quotations are largely nominal, and range about as follows, for prompt deliveries in buyers' yards, eastern Pennsylvania and adjoining territory:

No. 1 Steel Scrap and Crops.....	\$13.50 to \$14.00
Low Phosphorus.....	18.00 to 18.50
Old Steel Axles.....	18.00 to 18.50
Old Iron Axles.....	20.00 to 21.00
Old Iron Rails.....	18.00 to 18.50
Old Car Wheels.....	13.50 to 14.00
Choice No. 1 R. R. Wrought.....	15.50 to 16.00
Machinery Cast.....	14.00 to 14.50
Railroad Malleable.....	11.75 to 12.25
Wrought Iron Pipe.....	12.00 to 12.50
New Bundled Sheets.....	12.00 to 12.50
No. 1 Forge Fire Scrap.....	11.50 to 12.00
No. 2 Light Iron.....	7.50 to 8.00
Wrought Turnings.....	9.50 to 10.00
Stove Plate.....	11.00 to 11.50
Cast Borings.....	9.00 to 9.50
Grate Bars.....	11.75 to 12.25

Cincinnati.

CINCINNATI, OHIO, July 1, 1908.—(By Telegraph.)

A considerably better feeling exists in the local Iron and Steel trade, and hopeful signs are plenty. The only idle gray Iron foundry, that of the Weber Bros., who failed last December, was sold to-day. Manufacturers of agricultural implements, pumping machinery, electric power generators, metal working machinery, and engines are all sufficiently impressed with late and in some instances unexpected trade developments to warrant the sentiment ex-

pressed in the opening sentence. Inquiries in the machine tool line have not yet reached a point to be regarded as anything like normal, although there is some nice business being closed up on single tool and pairs. In finished lines no specially encouraging signs have followed the announced reductions, and buying is of the hand to mouth order.

Pig Iron.—There is no marked change to be recorded in the condition of the Iron market as compared with last week, unless one expects the relative attitude of buyers and sellers. They seem to be further apart on such business as is going, and rumors of cutting by a large interest in the South which a few weeks ago led the advance are plenty. There is suspicion also that some Southern High Silicon Irons have invaded the market to good purpose. Ohio Silveries are still held firm at \$18.50, at furnace, for 8 per cent. Spot Iron is weak at \$12, Birmingham, and \$15, at southern Ohio furnace, for No. 2, with interests in the Hanging Rock District holding for \$15.50 and \$16 and piling Iron. If present plans are carried out, an additional competitor at the lower price will be furnished in the blowing in of a new stack in Ironton about August 1. Both stacks of the Dayton Coal & Iron Company in Tennessee are now idle, the active furnace having been banked last week. It is expected that the smaller of the Vanderbilt furnaces, in Alabama, will be put on Basic within a few weeks. Consumers are asking for prices on next year's delivery, which furnace companies are not as yet giving, although a prominent agent has ventured an advance of \$1 above the present market. The scarcity of Forge has been well illustrated in late prices. One agency sold a few days ago a good sized tonnage at \$10.75, Birmingham, and is to-day asking \$11. A sale that is expected to be closed here to-day is of 3000 tons of Bessemer, 1000 tons of low grade, 500 of Silvery and a few hundred of Ferro-manganese to a prominent agricultural implement interest in northern Indiana. A price of \$16.25, Valley furnace, has been quoted on the Bessemer, but it is said that the Iron will go at a lower figure. A large Eastern pump interest is in the market for 1200 tons in special lots of High Manganese, High Silicon and some Foundry to analyze about No. 2, for delivery through the next 12 months. A local foundry interest wants 800 tons of Northern or Southern No. 2, the same amount of No. 3, 200 of Low Phosphorus and 200 of High Manganese for the last half. For early delivery and balance of the year we quote, f.o.b. Cincinnati, as follows: Freight being \$3.25 from Birmingham, and \$1.20 from the Hanging Rock District:

Southern Coke, No. 1.....	\$15.75 to \$16.25
Southern Coke, No. 2.....	15.25 to 15.75
Southern Coke, No. 3.....	14.75 to 15.25
Southern Coke, No. 4.....	14.25 to 14.75
Southern Coke, No. 1 Soft.....	15.75 to 16.25
Southern Coke, No. 2 Soft.....	15.25 to 15.75
Southern Coke, Gray Forge.....	13.75 to 14.25
Ohio Silvery, 8 per cent. Silicon.....	19.70
Lake Superior Coke, No. 1.....	16.70 to 17.70
Lake Superior Coke, No. 2.....	16.20 to 17.20
Lake Superior Coke, No. 3.....	15.70 to 16.70
Standard Southern Car Wheel.....	22.25 to 22.75
Lake Superior Car Wheel.....	21.75 to 22.25

(By Mail.)

Coke.—Oven operators manifest a disposition to contract at a slight advance over spot prices for six months' delivery, but will not fill a year's requirements at these figures. Connellsville best Foundry grades are obtainable under these conditions at about \$2.25, at oven. Indications at selling agencies here point to a gradually increasing Foundry melt, and Coke is being taken on contract in very good form. Some furnaces in the southern Ohio District are blowing out, but others going in will balance pretty well, keeping consumption at about the same ratio during the balance of the warm weather.

Finished Iron and Steel.—Spasmodic and intermittent buying characterizes the Finished markets. Little life is seen in any line, save perhaps twisted Steel Bars for reinforced concrete work, which are in good demand here just now and selling out of stock at about 2.20c., base, cut in lengths not less than 5 ft. Some inquiry is also noted for Steel Hoops, which sell in small lots at 2.20c. to 2.30c., base, f.o.b. Cincinnati. Otherwise prices remain unchanged, and orders are filled from stock at the following prices, f.o.b. Cincinnati: Iron Bars, carload lots, 1.65c., base, with half extras; small lots from store, 1.85c., base, half extras; Steel Plates, carload lots, 1.75c., base, with half extras; small lots from store, 1.85c., base, half extras; Base Angles, carload lots, 1.85c., base; small lots from store, 2.10c.; Beams, Channels and Structural Angles, 1.85c., base; small lots from store, 2.10c.; Plates, 1/4 in. and heavier, carload lots, 1.85c.; small lots from store, 2c.; Blue Annealed Sheets, heavy, No. 16, carload lots, 2.15c.; small lots from store, 2.50c.; No. 14, carload lots, 2.05c.; small lots from store, 2.40c.; No. 10, and heavier, carload lots, 1.95c.; small lots from store, 2.20c.; No. 12, carload lots, 2c.; small lots from store, 2.30c.; Sheets (Light), Black, No. 28, carload lots, 2.65c.; Galvanized Sheets, No. 28, carload lots, 3.70c.; Steel Tire, 4 in. and heavier, carload lots, 1.95c.; Plates, 3-16 and No. 8, carload lots, 2c.; small lots from store, 2.20c.

Old Material.—Rolling Mill Scrap is defined as practically dead in this market. Dealers are all loaded up with choice stocks which are not moving at present low prices. Consumers have evidenced a willingness to take some lines of Old Metal at ruling prices for delivery next year, and for 60 to 90 days, but dealers are turning them down. The largest buyers here have immense stocks which they are holding, believing firmly that there will be an active demand after the election. The Cincinnati supply is practically controlled by two or three dealers, and it is evident that the control is held firmly. Dealers' prices to the trade, f.o.b. Cincinnati, are about as follows:

No. 1 R. R. Wrought, net ton.....	\$10.50 to \$11.50
Cast Borings, net ton.....	4.00 to 5.00
Heavy Melting Steel Scrap.....	11.00 to 12.00
Steel Turnings, net ton.....	5.00 to 6.00
No. 1 Cast Scrap, net ton.....	10.25 to 11.25
Burnt Cast and Wrought, net ton.....	8.00 to 9.00
Old Iron Axles, net ton.....	14.50 to 15.50
Old Iron Rails, gross ton.....	13.00 to 14.00
Old Steel Rails, long, gross ton.....	11.00 to 12.00
Old Steel Rails, short, gross ton.....	11.00 to 12.00
Relaying Rails, 56 lb. and up, gross ton.....	22.00 to 23.00
Old Car Wheels, gross ton.....	12.00 to 13.00
Low Phosphorus Scrap, gross ton.....	13.00 to 14.00

Birmingham.

BIRMINGHAM, ALA., June 29, 1908.

Pig Iron.—Notwithstanding the fact that the demand has not been stimulated, the market is without sign of weakness. The business offered the past week, as has been for some weeks previous, covered an unusual territory, and the aggregate tonnage involved was comparatively small, but reports from all producers indicate a favorable comparison of order book requirements with the rate of production and the outlook such as to warrant a conservative policy in making additional commitments. It is known that Southern Iron recently reported sold to an Eastern melter at \$11.50, Birmingham, for No. 3 Foundry, was only 500 tons, and the analysis specified was sufficiently low in silicon to permit of No. 3 Foundry being furnished. The company making this sale will increase its output July 1 and adheres firmly to \$12, Birmingham, for prompt deliveries and the third quarter. A schedule of \$12.50, Birmingham, for the last quarter has been adopted by practically all producers who are in position to accept orders for shipment within that period. There has been no negotiation for deliveries extending into 1909. Among the sales reported in the past week, 600 tons of No. 2 Foundry for the third quarter at \$12, Birmingham, is most significant. The sale of 300 tons of Gray Forge for prompt shipment is reported at \$10.75, Birmingham, as well as 200 tons of the same grade at \$10.50. A Stove manufacturer is in the market for 2000 tons to be delivered over the remainder of the year, and 500 tons for July delivery is being sought by another concern. The present movement of Pig Iron exceeds reports at any time since last October, without evidence of an anticipated reduction in the melt. It is to be noted that the increase in the melt within the past 10 days is material. The fact that the fiscal year of leading railroad interests ends June 30 is a significant one, and developments as to the course to be pursued by them will be awaited with some eagerness.

Cast Iron Pipe.—Among the orders now in sight is 800 to 1000 tons of Water Pipe for the city of Atlanta, Ga. The contract to cover this tonnage will be awarded July 8. The city of Pensacola, Fla., is to place contract for approximately 1000 tons of Water Pipe July 1, and a similar quantity is to be placed for Douglass, Wyo., June 30. The city of Cleveland, Ohio, is supposed to have placed a contract for 3000 tons of Water Pipe June 27. Of the small orders placed within the past week, the principal one is reported at an advance of \$2 per ton. The tonnage involved was not sufficient to warrant an advance in quotations, but with prices for raw material remaining firm, indications are not unfavorable for an advance at an early date. We quote as follows for Water Pipe, per net ton, f.o.b. cars here: 4 in. to 6 in., \$23; 8 in. to 12 in., \$22; over 12 in., average \$21, with \$1 per ton extra for Gas Pipe. For large municipal contracts departures from the figures probably result.

Old Material.—The condition of the market is such that a definite statement as to its strength is not warranted. Practically no business has been transacted within the past week, and the outlook for a reaction is without an encouraging feature. A revision of quotations is not authorized, although there is no incentive for concessions. We quote nominally as follows, per gross ton, f.o.b. cars here:

Old Iron Rails.....	\$15.00 to \$15.50
Old Iron Axles.....	14.00 to 15.00
Old Steel Axles.....	12.50 to 13.00
No. 1 Railroad Wrought.....	12.00 to 12.50
No. 2 Railroad Wrought.....	9.00 to 9.50
No. 1 Country Wrought.....	10.50 to 11.00
No. 2 Country Wrought.....	9.50 to 10.00
No. 1 Machinery.....	10.00 to 11.00
No. 1 Steel.....	9.50 to 10.00
Wrought Pipe and Flues.....	8.50 to 9.00
Stove Plate and Light Cast.....	8.50 to 9.00
Cast Borings.....	5.00 to 5.50

St. Louis.

ST. LOUIS, MO., June 29, 1908.

The situation in the Southwest and locally, with regard to the flooded territory, has improved and is rapidly admitting of the resumption of business and traffic. For the past month the condition has been sufficiently serious to act as a deterrent to the otherwise favorable outlook. Parties identified with railroad supplies report an improved demand for the lighter material and appliances and find the railroads more prompt in payment of accounts. As is usual during the heated term, some of the local rolling mills have closed down and are improving the time by making repairs to their plants.

Coke.—The market is quiet, but firm. While inquiries are continuing to come in, no important sales are reported. The inquiry noted last week for a round lot is expected to result in a sale within the next few days. There is no change in price. We quote Connellsville 72-hr. Foundry for immediate and future shipment at \$2.15 and \$2.50 at oven.

Pig Iron.—Notwithstanding the demand, so far as actual sales is concerned, is ruling quiet, the market is strong. Difficulty is being experienced in placing even small orders with Southern furnaces where prompt shipment is desired. The minimum price is \$12, Birmingham, with some furnaces holding at \$12.50 for the last quarter. It is reported that the Southern field is well sold up for July, August and September.

Structural Material, Bars, &c.—There have been no contracts involving large tonnage in Structural Material, yet the various sales agencies and local plants are in receipt of considerable business in small orders. Requests for shipment of contracts show a gratifying urgency. Specifications for material on previous bookings include also Bars and Track Material. Orders for small lots of Standard Rails are reported. Merchant Steel is in better inquiry. Specifications are coming in more freely from railroads for Bars and Plates.

Metals.—Pig Lead is in fair demand at 4.40c. to 4.45c. for common and 4.52½c. for special brands. Spelter is ruling somewhat easier. To-day's price is 4.40c. There is a slack demand, but production is falling off and stocks in dealers' hands are decreasing. Antimony is easier. Casting Copper is off ½c. Lake Copper has also declined ½c. and the demand is lighter.

Old Material.—With but a light demand from the mills, which at this season of the year are usually either closed down or running on half time, it may be said to be a dealers' market. Transactions are mainly confined to Steel Scrap, which is ruling higher in price. Car Wheels, Railroad Wrought and Cast Scrap are held at some advance on last week's figures. Quotations per gross ton, f.o.b. St. Louis, are as follows:

Old Iron Rails.....	\$14.00 to \$14.50
Old Steel Rails, rerolling.....	12.20 to 12.50
Old Steel Rails, less than 3 ft.....	12.00 to 12.25
Relaying Rails, standard sections, subject to inspection.....	22.50 to 23.50
Old Car Wheels.....	12.50 to 13.50
Heavy Melting Steel Scrap.....	11.75 to 12.00
Frogs, Switches and Guards, cut apart.....	11.50 to 12.00
Mixed Steel.....	9.00 to 9.50

The following quotations are per net ton:

Iron Fish Plates.....	\$11.50 to \$12.00
Iron Car Axles.....	14.50 to 15.00
No. 1 Railroad Wrought.....	11.75 to 12.00
No. 2 Railroad Wrought.....	9.50 to 11.00
Railway Springs.....	9.50 to 10.50
Locomotive Tires, smooth.....	12.00 to 12.50
No. 1 Dealers' Forge.....	9.50 to 10.00
Mixed Borings, etc.....	3.50 to 3.75
No. 1 Bolders, cut to Sheets and Rings.....	7.00 to 8.00
No. 1 Cast Scrap.....	11.00 to 11.50
Stove Plate and Light Cast Scrap.....	9.00 to 9.50
Railroad Malleable.....	9.25 to 9.75
Agricultural Malleable.....	8.50 to 9.00
Pipes and Flues.....	7.25 to 7.50

The demand for locomotive driver brakes shows some improvement and the outlook is better than it was two months ago. The general air brake business for steam roads begins to show a slight gain, with indications of quite a marked improvement in the next two months. The general air brake business for electric roads is very promising. Inquiries are coming in freely and more orders have been received for this month than during several months.

A large jobbing house in Iron and Steel reports the country trade ordering freely in small lots. As compared with last year, the business shows an average decline of only 25 per cent.

The Helmbacher Iron Works has recently started up for the manufacture of Bar Iron, Car Links, Pins and small forgings.

The Missouri Bridge & Iron Works is running full on orders for bridge work and is employing the same force as last year.

Local elevator builders find some improvement in conditions.

The Missouri, Kansas & Texas shops at Parsons, Kan.,

that employ 850 men and closed May 16, have been ordered to reopen July 1, and it is understood that all the other shops on the system have been ordered reopened.

Pittsburgh.

PARK BUILDING, July 1, 1908.—(By Telegraph.)

Pig Iron.—The market continues quiet, and not much improvement in demand is looked for until next month at least. Many finishing mills shut down Tuesday night for inventory and repairs, which will decrease consumption very materially for the greater part of this month. We quote Sand Cast Bessemer Iron at \$16; Basic, \$15 to \$15.50; Malleable Bessemer, \$15.25 to \$15.50; No. 2 Foundry, \$15; Forge, \$14 to \$14.10, all f.o.b. Valley furnace, the freight rate to Pittsburgh being 90c. a ton. We note a sale of 1000 tons of Sand Cast Bessemer at \$16; 200 tons at the same price, 300 tons of Basic at \$15.25 for third quarter and 1000 at \$15.50 or last quarter, all at Valley furnace.

Steel.—Sales have been made of about 2000 tons of Bessemer Billets, 4 x 4 in., and 5½ x 5½ in., at the full official price of \$25, Pittsburgh, with freight to destination added. There is a little more inquiry for Steel, but the amount being sold is very light. Specifications against contracts for Sheet and Tin Bars are fairly satisfactory. Slightly better demand is reported for Forging Billets. We quote Bessemer and Open Hearth Billets, 3½ in. and larger, up to and including 0.25 carbon, \$25; 0.26 to 0.60 carbon, \$1 extra; over 0.60 carbon, \$2 extra, all f.o.b. Pittsburgh. For Wheeling, Martins Ferry, Follansbee, Newcastle, Sharon, Steubenville and Washington (Pa.) delivery, half the freight or 50c. additional is charged. Sheet and Tin Bars in random lengths are \$27, f.o.b. Pittsburgh. Forging Billets take \$2 advance over Rolling Billets.

(By Mail.)

Additional large orders for Steel Bars have been taken, and official advices are that the total in new orders and in extended contracts secured since the reduction in prices was made is 650,000 tons. This is a much heavier quantity than was placed last year, and indicates strongly that the large Steel Bar interests will be pretty well employed over the next twelve months. Prices of Steel Bars are very firm on the basis of 1.40c., Pittsburgh. On Monday, the American Sheet & Tin Plate Company reached a settlement with the Amalgamated Association on the Sheet and Tin Plate scales, the men accepting some severe cuts. General conditions in the iron trade have been quiet the past week, but the feeling is more optimistic, and while July is always a dull month, it is confidently believed that early in August there will be a material increase in orders. A number of finishing mills will close down on the night of June 30, for inventory and repairs, among these being the mills of the Republic Iron & Steel Company and of the Western Bar Iron Association that sign the Amalgamated scale. It is believed a settlement of the scales will be reached early in July with these two interests, as the men realize that with a heavy reduction in prices of Iron and Steel Bars, they will have to accept a corresponding reduction in wages.

Ferromanganese.—No sales of moment are reported. We quote 80 per cent. foreign Ferro at \$44, seaboard, for third quarter, and about \$45, for fourth quarter, the freight rate to Pittsburgh being \$1.95 a ton.

Ferrosilicon.—With no recent sales, we quote 50 per cent. at \$70, Pittsburgh.

Rods.—The market is bare of inquiries, and the amount of new business taken is relatively small. We quote Bessemer Rods at \$33, Basic at \$34 and Chain Rods at \$33, f.o.b. Pittsburgh.

Muck Bar.—We continue to quote nominally \$26, Pittsburgh, for best grades of Muck Bar made from all Pig Iron.

Skelp.—The market is very quiet. Prices are largely nominal, and we quote: Grooved Steel Skelp, 1.45c. to 1.50c.; Sheared Steel Skelp, 1.50c. to 1.60c.; Grooved Iron Skelp, 1.60c. to 1.70c., and Sheared Iron Skelp, 1.70c. to 1.75c., f.o.b. Pittsburgh.

Steel Rails.—The Carnegie Steel Company has taken orders for about 1700 tons of Light Rails, while specifications against old contracts for Standard Sections are coming in more freely. Regular quotations on Light Rails, which are shaded \$4 to \$5 a ton to meet competition of mills that reroll Rails, are as follows: 25 to 45 lb. Sections, \$28; 20-lb., \$29; 16-lb., \$30, and 12-lb., \$32. We quote Standard Sections at \$28, at mill, and Angle Splice Bars at 1.65c., at mill.

Plates.—New business is still of a hand to mouth character, but we may note that the Carnegie Steel Company is rolling a heavy tonnage in Plates to be made into Pipe for the Standard Oil Company. Two or three mills, that do not

make a full assortment of sizes, are still shading prices from \$1 to \$1.50 a ton. Regular prices are as follows: Tank Plates, ¾-in. thick, 6¼ in. up to 100 in. wide, 1.60c., base, at mills, Pittsburgh. Extras over this price are as follows:

	Extra per 100 lb.
Gauges lighter than ¼-in. to and including 3-16 in.	
Plates on thin edges.....	\$0.10
Gauges Nos. 7 and 8.....	.15
Gauge No. 9.....	.25
Plates over 100 to 110 in.....	.05
Plates over 110 to 115 in.....	.10
Plates over 115 to 120 in.....	.15
Plates over 120 to 125 in.....	.25
Plates over 125 to 130 in.....	.50
Plates over 130 in.....	1.00
All sketches (excepting straight taper Plates varying not more than 4 in. in width at ends, narrowest end being not less than 30 in.).....	.10
Complete Circles.....	.20
Roller and Flange Steel Plates.....	.10
"A. B. M. A." and ordinary Firebox Steel Plates.....	.20
Still Bottom Steel.....	.30
Marine Steel.....	.40
TERMS.—Net cash 30 days. Pacific Coast base, 1.50c., f.o.b. Pittsburgh.	

Structural Steel.—No local work has been placed in the past week, but a heavy tonnage is being figured on by the American Bridge Company and the McClintic-Marshall Construction Company for delivery in New York, Chicago and other large cities. Competition among fabricators is still keen, but it is said that prices for erected work are somewhat better. We quote: Beams and Channels, up to 15 in., 1.60c.; over 15 in., 1.70c.; Angles, 3 x 2 x ¼ in. thick, up to 6 x 6 in., 1.60c.; 8 x 8 and 7 x 3½ in., 1.70c.; Zees, 3 in. and larger, 1.60c.; Tees, 3 in. and larger, 1.65c.; Bulb Angles and Deck Beams, 1.90c. Under the Steel Bar card, Angles, Channels and Tees under 3 in. are 1.50c., base, for Bessemer and Open Hearth, subject to half extras on the Standard Steel Bar card.

Sheets.—As yet we are not able to report any increase in the demand for Sheets, which have been relatively quiet for some time, and at present the leading mills are able to operate to only about 40 per cent. of capacity. Prices, on the whole, are being maintained, but in exceptional cases slight concessions are sometimes made. Regular prices are as follows: Blue Annealed Sheets, No. 10 and heavier, 1.80c.; Nos. 11 and 12, 1.85c.; Nos. 13 and 14, 1.90c.; Nos. 15 and 16, 2c.; Box Annealed, Nos. 17 to 21, 2.25c.; Nos. 22 to 24, 2.30c.; Nos. 25 and 26, 2.35c.; No. 27, 2.40c.; No. 28, 2.50c.; No. 29, 2.60c.; No. 30, 2.70c. Galvanized Sheets: Nos. 10 and 11, 2.45c.; Nos. 12 and 14, 2.55c.; Nos. 15 and 16, 2.65c.; Nos. 17 to 21, 2.80c.; Nos. 22 and 24, 2.95c.; Nos. 25 and 26, 3.15c.; No. 27, 3.35c.; No. 28, 3.55c.; No. 29, 3.70c.; No. 30, 3.95c. No. 28 Painted Roofing Sheets, \$1.75 per square, and Galvanized Roofing Sheets, No. 28, \$3.10 per square, for 2½-in. corrugations. These prices are subject to a rebate of 5c. per 100 lb. to the large trade under the usual conditions, jobbers charging the usual advances for small lots from store.

Tin Plate.—Jobbers are placing only filling in orders to keep up a full assortment of sizes in their stocks, but the leading mills have a good deal of business booked. The leading interest is operating to practically full capacity, and this is the case with three or four independent mills. We quote at \$3.70 for 100-lb. Cokes, 14 x 20, f.o.b. Pittsburgh, terms 30 days, less 2 per cent. off for cash in 10 days, this price being subject to the usual rebate of 5c. per base box in large lots.

Hoops and Bands.—Specifications against contracts are fair, but practically no new orders are being placed. Regular prices are as follows: Steel Hoops, 1.80c., base, full Hoop card prices; Steel Bands, 1.40c., base, half Steel card extra, all f.o.b. cars Pittsburgh, in carload lots, for delivery during 1908.

Iron and Steel Bars.—The scales of the Republic Iron & Steel Company with the Amalgamated Association expired on the night of June 30, and an agreement has not yet been reached on the wage scales for the year beginning July 1. A conference is to be held with the Republic at an early date, and on July 7 the Amalgamated Association will meet the Western Bar Iron Association in conference. The mills have asked for a fairly large reduction, which the men at first did not seem inclined to consider, but it is probable that a settlement will be reached by both sides making concessions. Prices on Steel Bars remain firm on the basis of 1.40c., Pittsburgh, and the mills are busier and making larger shipments than for some time. As yet the tonnage placed in Iron Bars for forward delivery is rather light, but the demand is expected to improve in the near future. We quote Iron Bars at 1.40c., base, for Pittsburgh delivery, and 1.35c., base, for Western points, to which freight is added, except Chicago, the price for which is 1.50c., delivered. We quote Steel Bars at 1.40c., Pittsburgh, for base sizes.

Merchant Steel.—Some contracts have been placed for different grades of Steels by the implement makers, but the quantity covered so far is much smaller than anticipated. The demand for Tire Steel continues fairly active, and several mills have taken considerable business. Shafting continues dull. We quote: Cold Rolled Shafting, on contracts

for 100 tons and over, 57 per cent. off; carloads, 56 per cent. off, and less than carloads, 52 per cent. off, on which carload freight is allowed within base territory. Smooth Finished Machinery Steel, 1.80c. to 1.90c.; Flat Sleigh Shoe, 1.75c. to 1.85c.; Cutter Shoe Steel, 2.15c. to 2.25c.; Toe Calk, 1.90c. to 1.95c.; Railroad Spring Steel, 1.60c. to 1.75c., the higher price being for Pennsylvania Railroad analysis. Carriage Spring Steel is 1.80c.; Tire Steel, Iron, finished, 1½ in. and wider, 1.40c.; under 1½ in., 1.55c. Planished Tire Steel is 1.60c., all f.o.b. at mill.

Railroad Spikes.—No orders of moment are being placed. There is a fair demand for the smaller sizes, but only in small lots to meet current needs. We quote: Standard sizes, 4½ x 9-16 in., at \$1.70, and the smaller sizes at \$1.80 per 100 lb. in carload and larger lots, with an advance of 5c. per 100 lb. for less than carload, f.o.b. Pittsburgh.

Spelter.—The market on this material is no better, but on the contrary is easier. The demand is light, and there is a large overproduction. It is evident that the smelters will have to reduce their output materially or the demand will have to improve, before prices of Spelter will show betterment. We quote prime grades of Western at 4.30c., East St. Louis, equal to about 4.42½c., Pittsburgh. Hardly enough new business is being offered to test the market.

Merchant Pipe.—The demand holds up remarkably well in spite of the fact that jobbers are buying only to cover actual needs and to keep up sizes in stock. Both new orders and shipments of Pipe in June show a large increase over May. Spang, Chalfant & Co., Inc., have recently taken contracts from Western and local gas and oil interests for 30 miles of 16-in. and 10 miles of 10-in. Line Pipe. We can also state that it is likely inquiries will be out in a short time for about 300 miles of 8-in. Pipe for oil lines for the Pacific Coast. This inquiry came up about two years ago, but nothing was done with it at that time. It has recently been revived. Prices are firm. Discounts on Steel Pipe, ¾ to 6-in., to the large trade are now 76 and 5 per cent. off list. Regular discounts are as follows:

Merchant Pipe.	Jobbers, carloads, Steel.	
	Black.	Galv.
¼ to ¾ in.....	.67	51
¾ in.....	.69	55
1 in.....	.71	59
1½ to 6 in.....	.75	65
7 to 12 in.....	.72	57
Extra strong, plain ends:		
¾ to ¾ in.....	.60	48
1½ to 4 in.....	.67	55
4½ to 8 in.....	.63	51
Double extra strong, plain ends:		
1½ to 8 in.....	.56	45

Discounts on Genuine Iron Pipe are as follows:

	Black.	Galv.
	%	%
¼ to ¾ in.....	.65	53
¾ in.....	.67	57
1 in.....	.69	57
1½ to 6 in.....	.73	63
7 to 12 in.....	.70	55
Extra strong, plain ends:		
¾ to ¾ in.....	.58	46
1½ to 4 in.....	.65	53
4½ to 8 in.....	.61	49
Double extra strong, plain ends:		
1½ to 8 in.....	.54	43

Boiler Tubes.—The railroads are buying few Tubes, while the demand from the general trade for Merchant Tubes is only fair. Regular discounts on Merchant Tubes in small lots, on which an extra 5 per cent. is allowed in carloads, but which discounts are being shaded, are as follows.

Boiler Tubes.	Iron.	Steel.
1 to 1½ in.....	.42	47
1½ to 2¼ in.....	.42	59
2½ in.....	.47	61
2½ to 5 in.....	.52	65
6 to 13 in.....	.42	59
2½ in. and smaller, over 18 ft. long, 10 per cent. net extra.		
2½ in. and larger, over 22 ft. long, 10 per cent. net extra.		

Iron and Steel Scrap.—The shutdown of finishing mills on the night of June 30 is temporarily restricting the demand for Scrap, but it is expected that a number of consumers will shortly be in the market to cover their requirements when they start up again. The market is firm, and prices on some lines, notably Heavy Steel Scrap, Old Steel Rails for remelting, and Bundled Sheet Scrap are higher. One large consumer has recently bought a considerable tonnage of Heavy Steel Scrap. We quote per gross ton f.o.b. Pittsburgh: Heavy Steel Scrap for Pittsburgh, Steubenville and Sharon delivery, \$14; Cast Iron Borings, \$8 to \$8.25; No. 1 Railroad Wrought Scrap, \$13.75 to \$14; No. 1 Cast Scrap, \$14 to \$14.25; Bundled Sheet Scrap, \$10.75 to \$11.25; Sheet Bar Crop Ends, \$17.25 to \$17.50; No. 1 Busheling Scrap, \$12.75 to \$13; No. 2 Busheling Scrap, \$8.75 to \$9; Iron Axles, \$19.50 to \$20; Steel Axles, \$17.50 to \$18; Low Phosphorus Melting Stock, 0.04 and under, \$18 to \$18.50; Old Steel Rails, short pieces, \$14; Re-rolling Rails, \$14.50 to \$15; Machine Shop Turnings, \$8.50 to

\$8.75; Grate Bars, \$12.25 to \$12.50; Railroad Malleable Scrap, \$13 to \$13.50. We note sales of about 1000 tons of Heavy Steel Scrap at \$14; 500 tons of Busheling Scrap at \$13; 500 tons of Turnings at \$8.50 to \$8.75; and about 1000 tons of Re-rolling Rails on the basis of \$14.50, f.o.b. Pittsburgh.

Coke.—While there is a slightly better demand for Furnace Coke, due to the starting up of two or three furnaces, and prospective early operation of some other stacks, prices show no betterment. The estimated output of Coke in the Upper and Lower Connellsville regions for the first six months of 1908 is 4,500,000 tons, against 10,755,452 tons for the first six months of 1907. Strictly Connellsville Furnace Coke for prompt shipment is held at \$1.60, at oven, while on contracts for last half of the year \$1.80 to \$1.85 is quoted. The price of 72-hr. Foundry Coke is \$2 to \$2.25, depending on grade.

J. F. Robinson and Thos. A. Orr, of the firm of Robinson & Orr, and H. D. Stalnaker, recently manager of the Pittsburgh office of the Wilkoff Brothers' Company, dealer in Iron and Steel Scrap, have formed a corporation, to be known as the Stalnaker Iron Company, for the purpose of dealing in Iron and Steel Scrap, with offices at 2124 and 2125 Farmers' Bank Building, Pittsburgh. J. F. Robinson is president; Thos. A. Orr, vice-president and treasurer; H. D. Stalnaker, secretary and general manager. The present business of Robinson & Orr, dealers in Stocks and Bonds and Iron and Steel, will be continued at the present location, 419 Wood street, Pittsburgh.

Cleveland.

CLEVELAND, OHIO, June 30, 1908.

Iron Ore.—A moderate amount of Ore has been purchased the past week. Some furnace interests seem content to wait until later, and as yet are showing no interest in the market. Others are buying only a portion of their requirements for the year. These are expected to come into the market again later in the season when they can tell more definitely how much they will need to last them till the opening of navigation next year. Another reduction of 5c. a ton in the carrying charges for Ore has been announced, making the present rates, 10c. a ton, below those that prevailed last year. It is believed that the rates now established will be maintained the balance of the season. The rate per ton is now 65c. from the head of the lakes, 60c. from Marquette and 50c. from Escanaba. Contracts for carrying several hundred thousand tons of Ore have been closed with vesselmen at the new rate in the past few days. A number of the big shippers, however, have done no chartering, preferring to wait until the Ore is sold. The Ore movement is slowly increasing, but there are too many boats in commission for the cargoes and vessels are forced to wait for loads. Although shipments in July will show much improvement as compared with June, the indications are that the movement the coming month will be rather light. A committee representing the Merchant Ore firms and the furnace interests has worked out a new plan of figuring Ore prices, increasing the penalty on Ore running low in Iron content. When the Iron content was but slightly below the guarantee not much complaint of the present method of fixing the penalty was made by the furnacemen, but the latter claim that the penalty should be larger than at present when the Iron content runs 5 or 6 per cent. below the guarantee. It is believed that the new plan, which has been worked out with the exception of minor details, will prove satisfactory both to the Ore men and furnace interests. Ore prices for 1908 delivery at Lake Erie docks, per gross ton, are as follows: Old Range Bessemer, \$4.50; Mesaba Bessemer, \$4.25; Old Range non-Bessemer, \$3.70; Mesaba non-Bessemer, \$3.50.

Pig Iron.—The only sales reported were a few lots of 100 to 300 tons of Northern Foundry Iron for last half delivery. The purchasers were consumers who failed to cover in the recent buying movement. Producers feel encouraged because prices did not sag after the reduction in the price of Ore, and some of them are inclined to hold for slightly firmer prices. The market is firm, at \$15 to \$15.25. Valley furnace for No. 2 Foundry, for prompt shipment, and for the last half. Some furnaces are asking \$15.50 for the fourth quarter. Local furnaces quote No. 2 Foundry at \$15.75, delivered, Cleveland, and \$15.50, at furnace, for outside delivery. With Northern Foundry Iron lower than Southern, with the freight rate added, there is no inquiry for the latter in this territory. There is one inquiry for Bessemer Iron, the first that has appeared in the local market in some time. There are no inquiries for Basic or Malleable Iron. There is a little improvement in shipping orders for Foundry Iron on contract, indicating some increase in the melt. Furnace B of the Toledo Furnace Company will go in blast in about 10 days, and one or two other furnaces in this territory will probably be blown in within a few weeks. For prompt shipment and for the last half, we quote, delivered, Cleveland, as follows:

Bessemer	\$16.90
Northern Foundry, No. 1	\$16.25 to 16.65
Northern Foundry, No. 2	15.75 to 16.15
Northern Foundry, No. 3	15.25 to 15.65
Southern Foundry, No. 2	16.35
Gray Forge	14.90

Coke.—There is no inquiry for Furnace Coke, but the Foundry Coke market is fairly active. Prices are firm. We quote Connellsville Furnace Coke, for last half delivery, at \$1.85 to \$1.90, at oven. Some producers are holding to \$2 for the fourth quarter. We quote 72-hr. Foundry Coke at \$2.25, at oven, for last half delivery.

Finished Iron and Steel.—The condition of the market remains nearly stationary, although what change has appeared has been for the better. There is a little improvement in small orders for Steel Bars, Plates and Shapes, which is attributed to a little more activity among consumers rather than to the price reduction. Prices are being fairly well maintained, but some consumers, particularly of Plates, are holding off in the expectation of further price reductions. A number of manufacturers have cancelled their old contracts for Steel Bars and made new ones on the present price basis. It is understood that a number of the mills are making concessions to their customers, allowing them to make Steel Bar contracts for a year at the present prices, the contracts being the same as those of the implement makers. Following the spurt caused by the price reduction there is very little activity in Iron Bars. Prices are being fairly well maintained by Western mills, but the open cut by some of the Eastern mills is having the effect of rather unsettling the market. The Union and Empire rolling mills of this city will shut down July 3 for a month and perhaps longer. There is a fair improvement in the demand for Structural Material in small lots for local work, but fabricators, it is claimed, are quoting prices lower even than those at which work has been taken during the past few months. New municipal work has developed in Cleveland requiring an aggregate of about 500 tons of Structural Material for a house of correction and for a school building. In Plates price concessions are still being made by some of the smaller mills. The demand for Sheets is very light. Although some projects are pending there is little prospect that there will be any good sales of Rails for new traction lines in this territory this season. The Cleveland Board of Public Service has received a low bid of \$22.75 per ton for 3400 tons of Iron Pipe, ranging from 3 to 36 in. for Water Pipe extension, the price being for Pipe delivered on the streets. Newark, Ohio, has awarded a contract for 1100 tons of Iron Pipe at \$21.59 per ton. Warehouse business during June showed a slight improvement over the previous month. We quote Iron Bars at 1.45c., Cleveland, for car lots; Steel Bars, 1.50c., Cleveland, for car lots, half extras; Beams and Channels, 1.70c., base, Cleveland, and Plates, 1/4-in. and heavier, 1.70c., Cleveland. Dealers quote Sheets, mill shipments, car lots, Cleveland, as follows: Blue Annealed, No. 10, 1.90c.; Box Annealed, No. 28, 2.60c.; Galvanized, No. 28, 3.65c. Jobbers quote Iron and Steel Bars out of stock at 1.65c. to 1.70c. Beams and Channels out of stock are 2c., and Plates, 1/4-in. and heavier, 1.90c. Warehouse prices on Sheets are as follows: Blue Annealed, No. 10, 2.10c.; Box Annealed, No. 28, 2.70c.; Galvanized, No. 28, 3.85c. Warehouse prices on Boiler Tubes, 2 3/4 to 5 in., are 64 per cent. discount, and on Black Merchant Iron Pipe, base sizes, 71 per cent. discount.

Old Material.—The market continues quiet, but prices remain firm. There is little inquiry from consumers, and about the only activity is in small transactions among dealers who are covering on contracts. With many mills shut down a large part of July, dealers are not looking for much demand that month, but expect a good demand toward August. Expecting better prices then, they are not anxious to sell at present prices. An advance is noted in quotations on Old Car Wheels and Malleable and Cast Scrap. The Pennsylvania Railroad has a list out this week of about 1500 tons. Dealers' prices to the trade, per gross ton, f.o.b. Cleveland, are as follows:

Old Steel Rails	\$13.00 to \$13.50
Old Iron Rails	15.00 to 16.00
Steel Car Axles	16.50 to 17.50
Old Car Wheels	14.00 to 14.50
Relaying Wheels, 50 lb. and over	22.00 to 23.00
Heavy Melting Steel	12.50 to 13.00
Railroad Malleable	12.00 to 12.50
Agricultural Malleable	11.00 to 11.50
Light Bundled Sheet Scrap	8.00 to 9.00

The following quotations are per net ton, f.o.b. Cleveland:

Iron Car Axles	\$16.00 to \$16.50
Cast Borings	6.00 to 6.50
Iron and Steel Turnings and Drillings	7.00 to 7.25
Steel Axle Turnings	8.50 to 9.00
No. 1 Bushing	11.00 to 11.50
No. 1 Railroad Wrought	12.00 to 13.00
No. 1 Cast	12.00 to 12.50
Stove Plate	9.50 to 10.00
Bundled Tin Scrap	8.00 to 9.00

Harry Bialosky has resigned his position with L. I. Bregman & Co., dealers in old materials, and has bought an interest in the business of A. Rotter & Co., 1962 to 1988 Scranton road, Cleveland, Ohio. The old firm name of A. Rotter & Co. will be continued.

New York.

NEW YORK, July 1, 1908.

Pig Iron.—The market is quiet, and on the whole unchanged, with a relatively small group of sellers urgent to market Pig Iron at current prices. It is expected that the leading pump interest will to-day close contracts covering about 6000 to 8000 tons for New Jersey delivery, and 3000 to 4000 tons for New England delivery. A large electrical concern is asking for prices on about 2000 tons of Low Phosphorus Pig. We quote, at tidewater: Northern No. 1 Foundry, \$16.75 to \$17; No. 2 Foundry, \$16 to \$16.50, and No. 2 Plain, \$15.25 to \$15.50. Alabama Irons are quoted \$16.50 to \$17 for No. 1 Foundry, and \$16 to \$16.25 for No. 2 Foundry.

Steel Rails.—The Erie Railroad, which has bought what Rails it has needed this year, month by month, has taken 7500 tons for July delivery. A traction road has bought 700 tons, and there has been fair activity in frog and crossing work. The Seaboard Air Line receiver's order for 12,000 tons is really the reinstatement of business placed before the receivership with the Sparrows Point mill. The Tidewater Railroad has also contracted with the Pennsylvania Steel Company for 10,000 tons, or 2000 tons more than its original contract, which for some months has been held up. The Bethlehem Steel Company is reported to have taken an order for Girder Rails, this marking the entrance of a new competitor into that field.

Structural Material.—Sales at the reduced price fixed a few weeks ago have been made for delivery in the next six months. In the case of sales to jobbing interests deliveries are limited to three months. A factor which manufacturers of Structural Steel are expecting to assume greater importance in its bearing on the structural situation is the large accumulations of idle money. While projects like that of the Equitable Assurance Society's \$10,000,000 building, on which work is expected to begin in the coming year, are exceptional, it is an illustration of the reconstruction that is to be looked for in lower Manhattan for years. While several good contracts are pending, the week has not brought out a great deal of new business. The third section of the Pennsylvania Railroad viaduct work in connection with the Sunnyside, L. I., terminal, 800 tons, has not been let, as reported. The New Haven road has placed 425 tons of bridge work for the Harlem Division with the Pennsylvania Steel Company and about 1000 tons more is pending. The Rutland Railroad in Vermont has placed an order for 300 tons with the American Bridge Company. We continue to quote tidewater deliveries, mill shipments, as follows. Beams, Channels, Angles and Zees, 1.76c.; Tees, 1.81c. On Beams, 18 to 24 in., and Angles over 6 in., the extra is 0.10c. Material cut to length is sold from stock at 2 1/4c. to 2 1/2c.

Ferroalloys.—A round lot of 80 per cent. Ferromanganese was sold this week at \$44.50, Baltimore. The market ranges between \$44.50 and \$45.50, with some few holders of choice Continental brands asking higher prices. The demand for 50 per cent. Ferrosilicon is dull, but it can be secured at \$70, seaboard, or maker's works. For a fair order the freight rate would possibly be absorbed to inland points.

Bars.—It is understood that the Eastern Bar Iron Association has passed out of existence, due to the withdrawal of leading companies. The Bar Iron market has shown the effect of the practical abandonment of efforts to maintain prices, and quotations now range from 1.36c. to 1.46c., tidewater, according to quality and quantity. The demand has not been large. Steel Bars continue to be quoted at 1.56c., tidewater.

Plates.—The local demand is light, and inquiries do not indicate any early resumption of activity. Prices of standard sizes are as follows, at tidewater: Sheared Plates, 1.76c. to 1.86c.; Flange Plates, 1.86c. to 1.96c.; Marine Plates, 2.16c. to 2.26c.; Firebox Plates, 2.65c. to 3.50c., according to specifications.

Cast Iron Pipe.—Conditions are looking a little better in this branch of trade. Quite a number of contracts are in sight. Manchester, Mass., will open bids July 10 for 443 net tons of 16-in. and 523 net tons of 14-in. Water Pipe, as well as a small quantity of special castings. New York City is preparing to purchase a considerable quantity. Within the next four weeks the city will put out specifications for about 6000 tons, principally 6 and 12 in. A city contractor will this week buy about 2800 tons of 30-in. to apply on some work recently taken by him. The Western gas companies are beginning to put out inquiries. One of the most important of these is the inquiry of the Laclede Gas Company, St. Louis, for 20 to 25 miles of Gas Pipe. The Lynchburg Foundry Company recently secured 1400 tons of Water Pipe awarded by the city of Washington, D. C. Prices are firm for carload lots on the basis of \$24.50 to \$25 per net ton at tidewater for 6-in.

Old Material.—A generally better feeling prevails as to the future, although in most lines trade is exceedingly dull. Improvement is seen in No. 1 Railroad Wrought, which is in better demand at slightly higher prices. Wrought

Pipe is being purchased more freely, at prices 25c. to 50c. per ton higher than a month ago. No. 1 high grade Heavy Cast Scrap is rather eagerly wanted, with little to be had in this vicinity for immediate shipment. Several inquiries have been received for this grade of Scrap for delivery in the next three months, but it cannot be learned that any sales were made as dealers have been chary of contracting to make shipments within this time. Practically the same conditions are found in Stove Plate. Steel Scrap is rather quiet, but this is due to the fact that quite large quantities have been bought within the past month or so by the leading Eastern Steel companies, and these buyers are now out of the market. The opinion quite generally prevails that all grades of Old Material will command higher prices before September 1. Quotations are about as follows per gross ton, New York City:

Old Girder and T Rails for melting.....	\$10.00 to \$10.50
Heavy Melting Steel Scrap.....	10.00 to 10.50
Old Steel Rails, rerolling lengths.....	11.50 to 12.00
Relaying Rails.....	20.50 to 21.50
Old Iron Rails.....	14.50 to 15.00
Standard Hammered Iron Car Axles.....	16.00 to 16.50
Old Steel Car Axles.....	14.50 to 15.00
No. 1 Railroad Wrought.....	13.50 to 14.00
Iron Track Scrap.....	10.00 to 10.50
No. 1 Yard Wrought, long.....	11.50 to 12.00
No. 1 Yard Wrought, short.....	10.50 to 11.00
Light Iron.....	5.50 to 6.00
Cast Borings.....	5.00 to 5.50
Wrought Turnings.....	6.50 to 7.00
Wrought Pipe.....	10.00 to 10.50
Old Car Wheels.....	12.50 to 13.50
No. 1 Heavy Cast, broken up.....	13.00 to 14.00
Stove Plate.....	9.50 to 10.50
Locomotive Grate Bars.....	10.50 to 11.00
Malleable Cast.....	11.50 to 12.50

Iron and Industrial Stocks.

NEW YORK, July 1, 1908.

The course of the stock market since our last report has been quite interesting. It had been generally expected that the American Locomotive Company would pass or reduce its quarterly dividend on the common stock, but contrary to the general expectation the management decided to pay the full dividend, and the stock advanced on Thursday of last week from 43 to 48, probably causing some confusion among those who had sold short. While this action has been criticised, it nevertheless had the effect of strengthening other industrial stocks, notwithstanding some adverse developments among railroad stocks. The range of prices on active iron and industrial stocks from Thursday of last week to Tuesday of this week was as follows: United States Steel common 36¼ to 38¼, preferred 101½ to 102¾; Car & Foundry common 33¼ to 34¾, preferred 97¾; Locomotive common 43 to 48½, preferred 101 to 102; Steel Foundries common 6¼ to 7½, preferred 35 to 36; Cambria Steel 31½ to 31¾; Colorado Fuel 26 to 27¼; Crucible Steel common 5¾ to 5¾, preferred 39½ to 41; Pressed Steel common 26 to 28, preferred 82¾; Republic common 16½ to 18¼, preferred 63½ to 66½; Sloss-Sheffield 49 to 52¼, preferred 95½ to 96; Cast Iron Pipe common 19½ to 21¾, preferred 63 to 66; Can common 4½, preferred 53¼ to 54¼. Last transactions up to 1.30 p.m. to-day are reported at the following prices: United States Steel common 38, preferred 102¾, bonds 97¼; Car & Foundry common 34¾, preferred 97¾; Locomotive common 47¼, preferred 101¼; Colorado Fuel 27; Pressed Steel common 28, preferred 82¼; Railway Spring common 36; Republic common 17¾, preferred 66½; Sloss-Sheffield common 52; Cast Iron Pipe common 21, preferred 64¼; Can common 4½, preferred 54¼.

Dividends.—The American Locomotive Company has declared the regular quarterly dividend of 1¼ per cent. on the preferred stock, payable July 21, and 1¼ per cent. on the common stock, payable August 26.

The E. W. Bliss Company, Brooklyn, N. Y., has declared a quarterly dividend of 2½ per cent. on the common stock and 2 per cent. on the preferred stock.

The American Brake Shoe & Foundry Company has declared the regular quarterly dividends of 1 per cent. on the common stock and 1¾ per cent. on the preferred stock.

At the close of the fiscal year, June 30, the deficit in the United States Treasury for the 12 months was \$59,655,992, as compared with a surplus one year previous of more than \$84,000,000. The receipts from all sources in the past fiscal year were \$763,000,000. The disbursements were about \$823,000,000, or \$181,000,000 larger than in the fiscal year 1907. The increase in expenditure on account of public works was \$17,100,000, due largely to the Panama Canal construction. The expenditures for pensions have increased markedly, being \$14,600,000 over the preceding year, although it was predicted two or three years ago that the limit had been reached. The falling off in merchandise imports due to the business depression is responsible for the large deficit.

Metal Market.

NEW YORK, July 1, 1908.

Pig Tin.—A slight improvement in the volume of business, compared with the preceding week, is noticed. The demand, however, continues insufficient to bring the price up to import cost. Price changes have been within narrow limits, and on a downward trend, as follows:

	Cents.
June 24.....	27.55 to 27.60
June 25.....	27.40
June 26.....	27.40
June 29.....	27.35
June 30.....	27.35
July 1.....	27.20

The most favorable feature of the situation is the actual requisitions in hand from railroads for all kinds of metal. It has been unofficially rumored that these large consumers of metals would begin purchasing for repairs after July 1. Their anxiety to secure supplies as soon after the close of the fiscal year as possible was evident when metal dealers found in their mail this morning requisitions for small lots of metals. The statistics as compiled by C. Mayer, Secretary of the New York Metal Exchange, are more favorable toward higher prices than those of last month, the total visible supply in Europe and the United States being 14,155 tons June 30, a decrease of about 1300 tons as compared with the end of May. Stocks in the United States have increased about 400 tons, being 1500 tons at the end of June. Deliveries into consumption were figured as 3000 tons. The London market is lower than last week, closing to-day at £124 5s. 6d. for spot, and £125 7s. 6d. for futures. There are afloat for American ports 2249 tons.

Copper.—The market is undeniably lower, but it is scarcely as low as some rumors would lead one to believe. Electrolytic can be had at 12.62½ to 12.75c., and possibly a shade under for foreign account. Lake has likewise dropped from its level of 13c., and can be had at 12.87½c., from second hands, at least. Business is small, but consumption in America has improved, compared with two months ago. The export movement, as far as buying for consumption is concerned, is small; nevertheless, exports for June amount to 29,749 tons, which indicates that much metal has been sent abroad for financial reasons. The total exports for the first half of the year amount to 166,621 tons. Since this movement began, which was when prices fell to a level at which European interests would buy around October 1, there has been shipped from American ports 265,000 tons. In this period of nine months more metal has been sent out of this country than in any 12 consecutive months. European melters and warehouses all have large stocks, for Copper is not only going from this country, but from Japan and Australia. Consumption in Europe is lessening, and fresh confirmation of the slowing down in industrial activities there is frequently coming to hand. Operations in the Butte mining district were seriously curtailed during June, and it is possible that the mines in that district have not been producing as largely as reports from the mining district would lead those in the East to think. The fire in the Anaconda mine is of little importance at this stage. The London market is £1 lower than last week, closing to-day at £56 5s. for spot, and £57 for futures.

Pig Lead.—The leading producer continues to ask 4.50c. for round lots. The premium on spot has disappeared, and, in fact, some tired second-hand holders are offering at a less price. The St. Louis market is firm, at 4.40c. Outside producers of Lead are optimistic as to the course of prices, and look for higher quotations, but close observers of the market feel that any further attempt to raise prices would be unwise.

Spelter.—Lower quotations again prevail, and Prime Western brands can be had at 4.50c., New York, and 4.35c., St. Louis. Lower quotations have been heard, especially in the West, but operators here who have tried to buy in St. Louis found no better quotation than 4.35c.

Nickel.—The price continues unchanged, at 45c., for ton lots; smaller quantities are held at 55c. to 65c.

Antimony.—In spite of heroic attempts on the part of importers to advance quotations, Antimony is again lower. Hallett's is now selling at 8.25c. to 8.50c.; Cookson's at 8.50c. to 8.75c., and outside brands 8c. to 8.25c.

Aluminum.—The market is quiet, the leading producer asking 33c. for No. 1 ingots, and 30c. to 31c. for No. 2 ingots. Rods are quoted at 38c., and sheets at 40c., base. Large orders for commercial Aluminum can be placed at slightly lower figures.

Tin Plates.—Activity at the mill continues, but new business in this center is light. The price is absolutely without change, at \$3.89, New York, and \$3.70, Pittsburgh, for 100 lb. IC Coke Plates. In Swansea Welsh Plates are 1½d. higher, at 12s. 3d.

Old Metals.—Business continues fair, sales of heavy Copper having been made this week on a basis of about 12.10c., New York. The foreign demand is likewise fair, but accumulators of Scrap complain that they cannot secure

all the material desired. The following dealers' selling prices are unchanged from last week:

	Cents.
Copper, Heavy and Crucible.....	12.00 to 12.25
Copper, Heavy and Wire.....	11.75 to 12.00
Copper, Light and Bottoms.....	10.75 to 11.00
Brass, Heavy.....	8.75 to 9.00
Brass, Light.....	7.00 to 7.25
Heavy Machine Composition.....	11.50 to 11.75
Clean Brass Turnings.....	7.75 to 8.25
Composition Turnings.....	9.00 to 9.50
Lead, Heavy.....	4.20
Lead, Tea.....	3.85
Zinc.....	3.50

The Vulcan Detinning Company.

In its application for the listing of its stock on the New York Stock Exchange, the Vulcan Detinning Company says:

The company was incorporated under the laws of the State of New Jersey, April 25, 1902. Authorized capital, preferred stock, 7 per cent. cumulative, \$1,500,000; common stock, \$2,000,000. All issued and outstanding. Par value of shares \$100 each. The name, location, acreage and capacity of plants are as follows:

Name.	Location.	Acreage.
Vulcan Metal Refining Branch (detinning).....	Sewaren, N. J.	6
Vulcan Western Branch (detinning).....	Streator, Ill.	55
Empire Foundry (iron castings).....	Sewaren, N. J.	1 1/4

The business of the company is to purchase waste tin plate scrap from manufacturers of tinware, tin cans and similar articles, and to separate the component metals (tin and steel), by a chemical and electrolytical process. This process is a secret one, and, by a recent decision of the Court of Errors and Appeals of New Jersey, has been declared to be secret and to be the sole and absolute property of the company. In addition thereto the company owns patents on a number of the principal and important appliances. The product is tin and steel plate scrap, the tin being sold to manufacturers of pig tin, tin alloys, solder, electrotyp and babbitt metal, &c., and to terne plate manufacturers, while the steel scrap is sold partly to steel mills and partly manufactured in the Empire Foundry (recently acquired) into castings of various kinds.

The Vulcan Metal Refining Branch is located at Sewaren, N. J., on the Long Branch Division of the Central Railroad of New Jersey. It also has a water front and dock for receiving and shipping by water a large proportion of its raw materials, as well as part of its steel product and coal. The plant comprises a number of brick or frame factory buildings, a complete machine shop, blacksmith shop, &c. Erected in 1899 with a capacity of 10,000 tons of tin scrap per annum, it has been in constant and uninterrupted operation since then. In 1901 the capacity was increased to 15,000 tons, and early in 1907 the plant was again enlarged, so that now its capacity is 25,000 tons of tin scrap per annum.

The Vulcan Western Branch is located on the line of the Chicago, Indiana & Southern Railroad at Streator, Ill., at which place quite a number of railroads are converging. This plant was built in 1900, destroyed by a cyclone in 1903, immediately reconstructed entirely out of earnings, and has steadily operated since that time. It is built of brick, and is likewise equipped with its own machine and blacksmith shop. The yearly capacity is 20,000 tons, the buildings, however, being of sufficient size to permit of a considerable extension of its producing capacity without important alterations.

The company has just acquired by purchase, for cash out of surplus, all the real estate, plant, machinery, appliances and patent rights of the Empire Iron & Metal Company, a corporation of the State of New York. This property immediately adjoins the Vulcan Company's property at Sewaren, N. J., on which there is a complete and fully equipped iron foundry, erected in 1906, of a capacity of about 20 tons of iron castings per day. The foundry will utilize a part of the scrap production of the detinning plant at Sewaren, the intention being to enlarge the same gradually until the company's entire output of scrap may be converted there into manufactured iron.

There is no bonded debt, and the company does not owe one dollar excepting for ordinary purchases of merchandise not yet due.

Yearly net earnings (after making all deductions for betterments and depreciation), dividends paid and surplus at end of each fiscal year, are shown in the following table:

April 26, 1902: Reserve fund, \$26,910; surplus, \$288,140.30; total, \$315,050.30.

Fiscal year.	Net earnings.	Dividends paid.		Surplus.
		Preferred stock.	Common stock.	
1902-3.....	\$181,525.36	5 1/4% \$78,750	3% \$60,000	\$357,825.66
1903-4.....	29,581.43	4 1/2% 67,500	2% 40,000	279,907.09
1904-5.....	56,791.35	1 1/4% 18,750	.....	317,948.44
1905-6.....	125,478.25	6% 90,000	.....	353,426.69
1906-7.....	117,866.05	6 1/2% 97,500	.....	373,792.74
1907-8.....	71,831.04	3 3/4% 56,250	.....	389,373.78

There are now due to the preferred stockholders accumulated dividends of 14 1/4 per cent. The last financial statement of the company, issued March 31, 1908, is as follows:

Assets.	
Cash, cash items and inventory of stock on hand.....	\$113,004.18
Plants, lands, tenements, patents, processes.....	3,832,977.45
Total.....	\$3,946,361.63
Liabilities.	
Accounts payable (not due).....	\$56,987.85
Capital stock.....	3,500,000.00
Surplus.....	389,373.78
Total.....	\$3,946,361.63

The business office of the company is at 157 Cedar street, New York. The fiscal year of the company ends March 31 of each year. The directors are Samuel R. Beardsley, New Jersey; Samuel J. Bloomingdale, Adolph Kern, Harry Kraus, Benjamin Nicoll, Eugene E. Spiegelberg, Isaac Stiebel, all of New York. The officers are: President, Samuel R. Beardsley; vice-president, Adolph Kern; secretary, Charles P. Hull; treasurer, Adolph Kern.

A Large Sale of Boilers.—The Rust Boiler Company, Pittsburgh, Pa., has sold to the Tennessee Coal, Iron & Railroad Company 11,000 hp. of Rust boilers, for the Ensley plant. They are in part to replace old boilers, with which the Ensley furnaces are now equipped.

Seiden S. Deemer, New Castle, Del., and associates have organized the Deemer Steel Casting Company, with a capital stock of \$250,000, to manufacture steel castings under the Deemer improved surface blown Bessemer converter process. The company has secured property with a frontage of 837 ft. on the Delaware River, upon which a plant will be erected as soon as the plans have been completed, with the intention of having it in operation within a year. Mr. Deemer has had 30 years' experience in the manufacture of steel castings. He was superintendent of the Brylton Steel Casting Company from the inception of that company eight years ago until last April, when his contract expired, and previously was for over 20 years with the Chester Steel Castings Company.

T. J. Mitchell, general manager of the W. J. Rainey Coke Company's interests, states that about 1000 of the company's coke ovens in the Connellsville region, which have been idle since December, were to be started up last week. The works comprise the Paul, near Vandergrift, 250 ovens; Revere, 200; Elm Grove, 100; Mount Brad-dock, 100; Acme, near Mt. Pleasant, 150; Fort Hill, 100. Construction will begin in the near future on the building of a large coke works on a tract of 700 acres of coal land owned by the company in Redstone Township, in the Connellsville region.

Premier Stolypin, who was called upon last week by a deputation of the Duma protesting against the formation of the proposed consolidation of Russian steel interests, which was expected also to include extensive coal and iron ore properties, said that the promoters of the enterprise had abandoned it. This action was due to the fact that the Government, which has in its discretion to impose a high or low capitalization tax on new corporations, had declined to grant a reduction. All similar projects, M. Stolypin said, would have to pass the Cabinet, which would look carefully to the public interest.

PERSONAL.

B. Nicoll of B. Nicoll & Co., New York, iron and steel merchants and representatives of the Wharton Steel Company, has sailed for Europe.

Judge E. H. Gary, chairman of the United States Steel Corporation, will probably go abroad next week.

Julius Preleuthner, formerly with the National Tube Company, Lorain, Ohio, has accepted a position as designer with the Bethlehem Steel Company. He will work on the reconstruction of the 28-in. structural mill, and later on will take charge of the construction in field.

Paul L. Wolfel, formerly chief engineer of the American Bridge Company and lately consulting engineer for the American Bridge Company of New York, has resigned his position and accepted the position of chief engineer of the McClintic-Marshall Construction Company, with works at Pittsburgh, Pottstown and Carnegie, Pa. He assumed the duties of his new position July 1. His headquarters are at Pittsburgh.

Stephen G. Hobert has been appointed a member of the Advisory Board of Consulting Engineers of the Chicago Smoke Abatement Commission and the city department of Smoke Inspection, filling the vacancy due to the recent resignation of A. Bement. Graduating at Cornell University in 1896, Mr. Hobert has since had charge of the engineering work of several large concerns in different States, among these being Swift & Co., Chicago; the Solvay Process Company, Syracuse and Detroit, and the Eastman Kodak Company, Rochester.

The Filer & Stowell Company, Milwaukee, builder of high grade heavy duty Corliss engines, is again represented in Chicago and vicinity by Frank Englehardt, with office at 735 Marquette Building. Mr. Englehardt, with the exception of a short period, has been handling the Filer & Stowell engines for about 10 years.

C. P. Wagoner, for eight years engineer of the plate department of the Riter-Conley Mfg. Company, Pittsburgh, is now connected with the Petroleum Iron Works Company, Sharon, Pa., in the same capacity.

Dartmouth College has conferred on C. J. H. Woodbury, Boston, Mass., the degree of doctor of science, this being the second time that he has received the same degree, the first being from Union College, New York, in 1906. He is secretary and treasurer of the National Association of Cotton Manufacturers.

C. C. Mason of the sales department of the Browning Engineering Company, Cleveland, left recently for Paris, where he expects to remain about nine months, looking after the interests of his company in France, Germany and Belgium.

H. B. Thwing of the Whitcomb-Blaisdell Company, Worcester, Mass., returned from Europe on Tuesday, after an absence of six weeks.

Charles H. Moyer, New York manager of the George V. Cresson Company, returned from Europe last week. During his absence he secured an important contract from a French firm.

George D. Evans has resigned as assistant manager of sales of the Cleveland office of the Republic Iron & Steel Company because of poor health. He will go to Colorado Springs, Colo., for an indefinite period.

William S. Pilling, of Pilling & Crane, Philadelphia, sailed July 1 for a two months' trip abroad. He will spend a considerable portion of the time in Switzerland.

B. F. Wilson, Jr., Birmingham, Ala., formerly manager of the Tennessee Coal, Iron & Railroad Company's Oxmoor furnaces, will have charge of operations at the Williamson furnace, which is expected to go into blast soon on foundry iron. Originally built of 50-ton capacity, this will be increased to about 100.

W. A. Bostwick, metallurgical engineer of the Carnegie Steel Company, is in Europe.

Dr. W. C. Heraeus has been awarded the John Scott Legacy Premium and Medal of the Franklin Institute of Philadelphia for his improvements on the Heraeus Le Chatelier pyrometer and the accuracy and interchangeability of the thermocouple which he has produced, known

as the Heraeus element, and sold by Charles Engelhard, Hudson Terminal Buildings, 30 Church street, New York City.

Sidney H. Wheelhouse, Cincinnati sales manager of the Westinghouse Machine Company, has become Pittsburgh sales manager of the Hooven-Owens-Rentschler Company, effective July 1. Cincinnati business friends tendered him a dinner at the Business Men's Club June 30.

OBITUARY.

JOSEPH CUMMINGS, at one time the owner of the old Columbian Foundry, at Duane and Centre streets, New York, died at Rutherford, N. J., June 26, aged 81 years. He was president of the Morris & Cummings Dredging Company, a pioneer in dredging with machinery.

JOSHUA WALTER RHODES, Pittsburgh, died June 30, at the home of his father-in-law, George H. Barbour, at Grosse Point, near Detroit, Mich., from a sudden attack of uræmic poisoning. He was born in Pittsburgh 35 years ago, and was educated in the Pittsburgh schools. His wife died about two years ago, leaving two daughters. Mr. Rhodes was a prominent figure in financial circles of Pittsburgh. In addition to being the head of the firm of Joshua W. Rhodes & Co., iron and steel brokers, he was connected with the United Iron & Steel Company, Colonial Trust Company and Columbia National Bank as director. His father and mother survive him.

A Sixty-two Story Building.—Plans have been filed with the Bureau of Buildings for a 62-story building, to occupy the block bounded by Broadway and Nassau, Pine and Cedar streets, New York, on a part of which now stands the building of the Equitable Life Assurance Society. The main building of the new structure will be 34 stories, or 489 ft. high. Above it the tower will extend 420 ft., containing 28 stories, finished with a cupola. There will be 38 passenger elevators, eight running to the top of the tower extension. Of the other high tower buildings in New York City the Singer Building is 617 ft. from the curb to the pinnacle, and the Metropolitan tower is 692 ft., or just 700 ft., counting the metal point which will ornament the lantern.

The American Sheet & Tin Plate Company and the Amalgamated Association came to an agreement on Monday as to the wage scales in the mills operated under the latter's rules. In the sheet scale all labor has been put on a tonnage basis, and the base of the scale for 26, 27 and 28 gauge sheets has been advanced from 2.30c. to 2.50c. per pound. In other words, 28-gauge will have to advance above 2.50c. before the men are entitled to any advance in wages. In the tin plate scale, wages of rollers, doublers, catchers, shearing and screw boy were reduced 6 per cent., and the base of the scale was advanced from \$3.40 to \$3.90 per base box. The base price of tin plate will have to be \$4 or above before the men will be entitled to any advance in wages. The concessions given by the Amalgamated Association to the American Sheet & Tin Plate Company will also be allowed to the independent sheet and tin plate mills.

The American Railway Association has ascertained that the railroads which are members of that organization had supplied themselves up to February, 1908, with 300,000 freight cars more than the business of the roads demanded under the average conditions of the fiscal year 1907. Non-member roads in the United States on the same date had only two-thirds of the equipment which their business demanded. Within the association 79 roads were deficient, while 127 had an excess. The last report of the association on surplus cars showed the number to be 350,000 on June 10, apart from the largely increased number of cars in shops, the repair of which is deferred because of poor earnings. On May 13 the number of idle cars was 404,534 in the United States and Canada, or 9071 less than the high point figure reported at the close of April.

The Machinery Trade.

NEW YORK, July 1, 1908.

Developments in the machinery trade the past week were such as to more clearly indicate an upward tendency, and the opinion is becoming more general that by fall there will be a marked increase in the demand. This optimistic feeling has been brought about by the renewed activity on the part of some of the important interests and the partial revival of a few of the larger projects which have been held in abeyance for many months. Not that these corporations are now in the market for extensive lines of equipment, but their inquiries indicate that they are getting ready to take up the matter of purchasing within the next few months. Thus one whose representative is inspecting standard tools intimates that it will probably purchase a large amount of machine tool equipment soon, and another, which received bids over a year ago, is asking for reduced prices. It is expected, however, that actual business the next two months will not vary much from the present dullness, there being not enough activity among buyers to cause a betterment in a usually dull period. Notwithstanding the improvement in the outlook, business the past week showed but little change. Orders were no more plentiful than the previous week, but some fair sized lots of tools were sold. Inquiries were light and generally covered but few tools each. Business for June was a disappointment with many of the machinery houses, the sales sheets showing a decrease from the previous month's business. When the month opened it was thought that the sales would equal, if not excel a little, those of April and May, and with a few houses only a slight variation was noted; but others report business worse than that for any month but one since the beginning of the year, the poorest month with some being January and others February.

Delaware, Lackawanna & Western Railroad's Machinery Requirements.

The Delaware, Lackawanna & Western Railroad continues to send out inquiries for machinery for its new shops at Scranton, Pa., and now has inquiries in the trade for about 12 machine tools, some of them of the heavier class. Bids for these tools are to be received by the railroad this week, and from the short time given to machinery houses to prepare their bids it is inferred that purchases will not be delayed more than the time necessary to tabulate the bids. As the construction of this plant progresses the railroad will probably come into the market from time to time for small quantities of tools, and as soon as the machine shop is built the company will probably ask bids for a large amount of equipment. As has been noted in these columns, the company will probably purchase about \$12,000 worth of new tools for its Keyser Valley freight car repair shops.

The construction of a new cut-off on the Delaware, Lackawanna & Western Railroad line between Lake Hopatcong and the Delaware Water Gap, which will include about 28½ miles of railroad, will entail the purchasing of considerable machinery on the part of contractors making the successful bids on the work, according to an engineer who is in close contact with the enterprise. It is stated that this is the largest piece of railroad construction of the kind undertaken in this country in some years and it will entail the expenditure of about \$10,000,000. The successful bidders on the work are: Section 1, Timothy Burke, Scranton, Pa.; section 2, Waltz & Reece, Billings, Mont.; section 3, D. W. Flickwire, Terry Building, Roanoke, Va.; section 4, W. H. Gahagan, 189 Montague street, Brooklyn, N. Y.; section 5, Hyde-Macfarlane Company, 7 East Forty-second street, New York; section 6, Reiter, Curtiss & Hill, Arcade Building, Philadelphia, Pa.; section 7, Smith & McCormack, Easton, Pa. The new cut-off will extend through a particularly difficult piece of country for railroad construction, and regardless of the fact that some of the contractors may have equipment on hand, it is stated that considerable buying will have to be done, especially in the way of rock drilling and excavating machinery, rock conveying apparatus, hoisting and a general line of contractors' equipment. The contractors will all establish offices at or near the work, it is stated, and in consequence it is expected that the buying will be done in this section.

Orders have been placed by Westinghouse, Church, Kerr & Co., New York, for the mechanical equipment for the new shops to be constructed at Spirit Lake, Idaho, for the Idaho & Washington Northern Railroad, for which they are engineers. This plant is to cost about \$100,000, and being modern in every respect, will necessitate the installation of good sized equipment, including wheel presses, lathes and all necessary machinery for machine and erecting shops. The plant is to consist of a machine and erecting shop, 70 x 210 ft.;

blacksmith shop and boiler room, 40 x 97 ft., and other smaller buildings.

From reliable sources we learn that the American Locomotive Company contemplates the purchase of a large amount of equipment for its Pittsburgh shops. It is not expected that the company will buy this equipment immediately, but it is intimated that the trade can look for some substantial inquiries within a short time. The company now has inquiries in the market for a few machine tools and has placed a few orders the past week, but we understand that all of the present requirements have not been covered.

The Universal Lock Nut & Bolt Company, with offices at 200 Broadway, New York, is making plans for erecting one or more plants for the manufacture of a new combination lock nut and bolt. The company will probably erect its first plant at Paterson, N. J., and negotiations are now under way for securing a site there. William Jacobus, treasurer and general manager, is in charge of the enterprise and under his directions plans are being prepared for a plant large enough to employ about 300 hands. It is stated that the company has orders enough on its books to keep a plant of this size busy for two years, and as soon as the plans are perfected bids will be obtained on the machinery equipment. This will include the purchasing of power apparatus and nut and bolt machinery. It is the company's intention to maintain its own machine shop, and it will manufacture its entire product from the raw material to the finished state. The bolts, it is stated, are adapted to use in railroad rails and machinery where bolts and nuts are subject to vibration. The vibration, it is stated, has a tendency to work the nut on tighter and to lock it, and it can only be unscrewed by use of a pinion. The company is negotiating for a site of about 12 acres in extent, and it is expected that work on the new plant will be begun before the summer is over.

The Pratt Institute, Brooklyn, N. Y., intends to build a new forge shop and foundry for the department of science and technology. Prof. Arthur L. Williston, director of the department, will have full charge of the purchase of machinery.

The recent fire at the plant of the Dickson Car Wheel Company, Houston, Texas, destroyed the machine, pattern and blacksmith shops. No plans have as yet been prepared for rebuilding these departments, and it is not likely that purchases of machinery will be made until plans for the new buildings have been completed.

The W. B. Forbes Company, Hoboken, N. J., is now ready to take up the purchase of the additional machinery it will need for completing the equipment of its new shops to be erected at Fort Trumbull, Conn. There will be a main building, 50 x 200 ft.; power house, 30 x 40 ft.; office building, 35 x 65 ft., all two stories in height.

The Tamaqua Mfg. Company, Tamaqua, Pa., general foundry and machine work and manufacturer of improved machinery, has decided to rebuild its plant which was recently destroyed by fire, but has not yet prepared plans for the new buildings nor ascertained the amount and character of new machinery it will have to purchase to replace that lost in the fire.

The Public Service Corporation of New Jersey is now asking bids on the large addition to its Marion power plant, mentioned in these columns, and a number of houses in this city are figuring on the equipment for furnishing the power and accessories, such as coal and ash handling machinery, cranes, etc. The addition will include sufficient equipment to generate about 18,000 kw. in two sets. The building will be 80 x 100 ft., and will be of steel and concrete construction.

The large amount of money to be spent for increasing the water supply of New York will probably be of considerable benefit to manufacturers of contractors' machinery for some time to come. Bids have already been received on part of the greatest piece of work, the Catskill aqueduct, and in addition the city is preparing to increase the water supply from Long Island. The Board of Estimate at its meeting last week approved plans for the proposed new water supply system in Suffolk County, which is to cost about \$40,000,000. The sum of \$22,000,000 was voted on account of the Catskill water project, making \$50,000,000 thus far granted for that work.

The Superintendent of Public Works, Albany, N. Y., will receive bids until July 21 for additional work on the Erie Barge Canal, covering contract No. 60, for the improvement of the canal from the west end of contract No. 6 to about ½ mile west of Adams basin bridge, length about 8 miles; contract No. 64, for the improvement of the canal from 600 ft. west of Prospect street bridge, Medina, to 100 ft. east of the Gasport bridge, length about 9 miles.

Chicago Machinery Market.

CHICAGO, ILL., June 30, 1908.

The existing dullness in the machinery trade was not especially emphasized, neither was it appreciably relieved by the volume of last week's transactions. There is still considerable irregularity in the distribution of orders, which

gives rise to a variation in the results reported by various machinery houses. One leading distributor of machine tools reports a fair increase over last month, with several prospective orders that are likely to materially increase the total; others have broken about even, while some have fallen behind. But, despite the indecisive movements of the present, there is a growing feeling of optimism respecting developments of the near future. This statement is not meant to convey the idea that the trade is expecting a rush of business, but rather a conservative increase that will lift the wheels of traffic out of the extreme rut of dullness into which they have fallen. This sentiment is strongly reflected in a number of letters received from manufacturers of various kinds of machinery. Typical of the expressions contained therein is the following statement of a Western manufacturer of steam pumps and hoisting machinery: "Our views on the financial and industrial situation are optimistic. Business conditions with us are improving, and we think will continue to improve. However, we do not look for any sudden or quick improvement in business conditions. We do think, though, improvement will be slow, but steady." The reason generally assigned for as the basis of the expected improvement is the promising prospects of bountiful crops. It is reasoned that the prosperity of the agricultural communities must be sensibly reflected in all lines of industry. Already the agricultural foundries are busier and the demand for agricultural machinery is exceedingly good. Jobbing foundries, however, are still quiet, showing no general increase in pig iron consumption.

A machine tool representative lately returned from a trip through the northern iron ranges reports an increasing demand for equipment from the iron mines. This is attributed to preparations that are being made for extensive development work which will call for the active employment of mechanical equipment in that region. A number of tool orders have lately been secured from shops in the iron country and other points in the Northwest. More inquiries, it appears, are emanating from Northwestern territory than elsewhere at the present time, and though they concern no large requirements individually, the aggregate of business represented is considerable.

The addition of three large buildings to the Hawthorne plant of the Western Electric Company, Chicago, is a development of importance in the Western machinery trade. Construction of these buildings will be begun at once, and when completed will result in a concentration of the company's interests in this plant. It is likely that a large part of the machinery required to equip the new additions will be transferred from the Clinton street plant, which will eventually be abandoned. The purchase of considerable new machinery will probably be necessary for the completion of the equipment, but as yet the wants of the company in this respect have not been fully planned.

The following are among the recent crane orders received by Pawling & Harnischfeger, Milwaukee, Wis.: Chicago City Railway Company, Chicago, one 7½-ton three-motor crane, 54-ft. span; Manistee Iron Works Company, Manistee, Mich., one 15-ton three-motor crane, 51-ft. span, and one 10-ton three-motor crane, 29-ft. span; Bethlehem Steel Company, South Bethlehem, Pa., three 10-ton five-motor cranes, 84-ft. span, and one 10-ton five-motor crane, 61-ft. span; Sewerage and Water Board of New Orleans, one 3-ton three-motor crane, 45-ft. span; Compania Minera De Penoles, New York, for shipment to Mexico, one 3-ton one-motor electric hoist crane, 40-ft. span; Savannah Lumber Company, Savannah, Ga., one 10-ton hand crane, 36-ft. span; Reading Iron Company, Reading, Pa., one 10-ton three-motor crane, 72-ft. span; Standard Cast Iron Pipe & Foundry Company, Bristol, Pa., six 10-ton three-motor cranes, 51-ft. span; one 6-ton three-motor crane, 51-ft. span; Phillips Sheet & Tin Plate Company, Clarksburg, W. Va., one 20-ton three-motor crane, 60-ft. span, and one 5-ton three-motor crane, 50-ft. span; Milton Mfg. Company, Milton, Pa., one 3-ton two-motor electric traveling hoist.

Notwithstanding the general curtailment of demand for generative and motive power equipment, the Murray Iron Works Company, Burlington, Iowa, has since the first of January, 1908, sold 35 units of Murray Corliss engines, amounting to 5700 hp.; Murray tubular and water tube boilers aggregating 4500 hp. in 62 units. The significant feature of this business is its wide distribution, consisting as it does of 75 individual orders from industrial plants of all kinds, scattered from New York to California.

The city of Marion, Ind., has under consideration the purchase of the following machinery equipment for the municipal electric light plant: One 500-kw., 2300-volt, 60-cycle engine type generator, direct connected to a horizontal cross compound condensing engine of about 800 hp. with surface condenser, and two 300-hp. water tube boilers. Alternate plans, however, contemplate the purchase of a 375-kw. 3-phase, 60-cycle engine type generator, to be direct connected to the same type of engines. Otis Weesner is superintendent.

Plans and specifications now in course of preparation for

a new municipal electric light plant at Clarkson, Neb., will soon be submitted to manufacturers of electric and power equipment for bids on the necessary machinery. The installation will comprise a steam plant to be run in connection with a water plant already installed.

Bids for the construction of a water works system for the city of Ricketts, Iowa, will be received until July 6. Plans and specifications are on file with the town clerk.

The city of Lodi, Wis., is about to purchase an additional 100-hp. boiler for its electric light plant.

The Common Council of Hartford, Wis., has authorized the building of a municipal electric light plant to cost \$27,000. The equipment of this plant will include two 300-volt 60-cycle single phase alternating current units with 30 and 60 kw. generators. We are advised, however, that specifications for this work have not as yet been completed. George E. Ines is deputy city clerk.

Cleveland Machinery Market.

CLEVELAND, OHIO, June 30, 1908.

There is considerable improvement in the orders and inquiries for special machinery as compared with the past few months. This improvement is noticed by the builders of machine tool equipment and special heavy machinery. While the demand for the ordinary run of machine tools has not picked up, plants making these tools are turning their attention to such special machinery as there is a demand for and in this way many plants are able to keep fairly busy that otherwise would be nearly idle. In the line of heavy machinery good inquiries have developed recently for coal and ore handling machinery, the inquiries coming from the Pennsylvania coal fields and from the Western mines. The prospective purchasers of this new mine equipment have been holding off until conditions improved and their present inquiries are expected to result shortly in the placing of orders; in fact, some of these orders are about as good as closed now. There is some improvement in the inquiries for shop cranes, but owing to the absence of the railroads from the market the locomotive crane market shows little if any improvement.

The past week has been unusually quiet with machine tool dealers, the volume of their orders being about as light as they have been during any week of the year. Sales were confined mostly to single tools. Some inquiries are pending, but none of them is for more than small requirements. Some industrial plants that have suffered from the recent depression are arranging to add new products to their lines and are placing orders for special tools and machinery, their present equipment, some of which is still idle, not being suitable for turning out these new products. The automobile makers are buying a few tools. While the demand from this source is still light, the outlook for future business is regarded as favorable. The automobile industry is in fairly satisfactory shape, and some of the plants are still running at full capacity to complete this season's output. Plants that make automobile parts are fairly busy.

The general industrial situation is regarded as more favorable on all sides. While in some lines of manufacturing the improvement in orders has so far only been light, the general feeling is much better, and although not a great deal of improvement is looked for during the summer months of July and August, there is a belief that conditions will materially improve early in the fall.

Owing to the fact that many factories shut down for a short time about July 1 for inventories, it has been decided to postpone "employment day" until August 1. At a meeting of representatives of the Manufacturers' Club, the Cleveland Chamber of Industry, Cleveland Improvement League, and Builders' Exchange, held a few days ago, resolutions were adopted urging all northern Ohio employers to put as many men to work as possible on the day set. The secretaries of the organizations represented were appointed a committee to take up the matter among the members of their own organizations. The joint committee organized by appointing Walter D. Sayle, president of the Cleveland Punch & Shear Works Company and of the Manufacturers' Club, as chairman, and A. E. Hyre, secretary of the Chamber of Industry, as secretary.

The Morgan Engineering Company, Alliance, Ohio, reports a very satisfactory increase in its orders and inquiries for cranes and special machinery. The company is running its plant at 75 per cent. of its capacity, and the working force will soon be further increased.

The Western office of the Waterbury Farrel Foundry & Machine Company, Williamson Building, Cleveland, reports that the volume of its orders, which showed much improvement during May, has kept up in a very satisfactory manner during June, and that inquiries for special machinery continue to come in in good shape.

George E. Neil, who is well known among the machinery

trade in this territory, has opened offices at 249 The Arcade and will conduct a general new and second-hand machinery agency. He will also handle a line of good specialties, including belting, roofing, &c.

With the intention of enlarging its business the Eureka Mfg. Company, which has a plant in Warren, Ohio, for the manufacture of display racks, store fixtures and novelties, has been incorporated, with a capital stock of \$10,000, by F. A. Millikan, F. B. Wadsworth, E. A. Millikan, C. L. Wood and F. E. Alexander.

The Johnson Bibb & Faucet Company, Upper Sandusky, Ohio, has been incorporated, with a capitalization of \$25,000, by John W. Johnson, Joseph E. Van Nostran, Homer S. Robinson, John Carey and Robert Carey.

The Buckeye Rubber Company, Akron, Ohio, has under erection a large addition to its plant to be devoted entirely to automobile tires. The new building is 40 x 231 ft. and three stories high.

The Western Reserve Machinery Company, Cleveland, has been incorporated, with a capitalization of \$10,000, by W. R. Holding, W. H. Bosworth, M. K. Bosworth, H. H. Holding and W. M. Crane.

Cincinnati Machinery Market.

CINCINNATI, OHIO, June 30, 1908.

Noticeable features of the past week were indicative rather of a hopefulness for the future than any feeling that present conditions have undergone a change for the better. This is shown in the taking on of additional help in most all departments, the more generally optimistic note to correspondence from dealers and salesmen in all parts of the country and the placing of contracts and specifications for various shop changes and improvements planned and laid out in the early or middle part of last year. Interviews with heads of departments of a number of the minor manufacturers of machine tools show that many have maintained their modest shop forces throughout the months of depression and worked full or nearly full time—55 hr. per week. An explanation is offered for this condition of affairs by a close observer. Such tools as have been acquired have been bought closely and have been of the universal types and medium and small sizes. This moved the less expensively constructed lathes, drills and the like, but left the special and high speed machines on stock floors. Another cause of the activity of these cheaper lines is the number of skilled mechanics who, held important positions in big shops and who were let out when the slump came. Those who had saved up some money fitted up small shops economically with such tools—lathes, sensitive drills and the like—as they could secure with limited means and started in business as general machinists, preferring to carry out long cherished dreams of independence than remain idle awaiting chances of reinstatement. Many of these makers of cheaper lines of tools profited, too, by putting their prices at a reasonable advance over those of the second-hand and slightly used tools. The result has been that these manufacturers have been busy through the slump and for the most part are in very good shape.

The head of one local concern making a neat little sensitive drill of about 300 lb. weight sold on one trip of about three weeks 68 of these tools.

The American Valve & Meter Company, Cincinnati, manufacturer of automatic water columns, tank fixtures, float valves, water meters, &c., will change its power system from belt drive to electrical. This was decided by the officers and directors in line with a determination to increase shop efficiency to take care of its rapidly growing business. The Reliance Engineering Company is preparing plans and specifications and will take bids on equipment. It has not yet been determined whether to employ direct or alternating current.

Local financiers are figuring with a prominent builder of engines from the East who is here investigating with a view of locating. At present a plan is under discussion which would see the taking over of a large local plant and perhaps consolidation with the Eastern concern, with headquarters here. Details are not yet ready for publication, but it is understood that preliminaries have been gone over and that all parties are satisfied with the location of the big plant in Cincinnati.

Local jobbing foundries are making little headway. The melt with strictly jobbing concerns has not increased, although some establishments located outside the city report increased business with local machine tool manufacturers. Very few foundries are buying pig iron. A few placed orders for tonnage ranging from 500 to 1500 tons a month ago at the time of the \$11.50 buying movement, but the larger of these were for the most part speculative. A number of castings contracts expire July 1, and it is reported that some manufacturers have succeeded in getting a contract on a flat price basis for the coming term.

The American Rolling Mill Company, Middletown, Ohio,

which is managed by Cincinnati people, is shut down for a week to invoice and for a general overhauling in certain departments. The company made a good record during the months of general mill depression and the officials are well satisfied with conditions, everything considered.

The Long & Alstatter Company, Hamilton, Ohio, maker of heavy punching and shearing machinery, has experienced a good demand for several special types built to specifications and to perform certain work marked out by large manufacturers of perforating machinery. One of the latest orders of this character is for a big machine for hot pressing continuous rail points. It weighs 40,000 lb. Heads of departments of the company are optimistic and express confidence in the future.

August Tuechter and Sherman Schauer of the Cincinnati Machine Tool Company returned Saturday from Atlantic City, well pleased and quite enthusiastic over the exhibits and general air of confidence in the future manifested by close observers and manufacturers who spent considerable of their time at the famous seaside resort while the Railway Master Mechanics' and Master Car Builders' associations were in session. There has been a little revival of trade with foreign countries, one order from abroad calling for three medium sized drills.

The Steptoe Shaper Company reports sales of a 24-in. triple gear through the Augustin Fuller Company, New York, for shipment to Mexico; 25-in. back gear type through the Salt Lake city branch of the Mine & Smelters Supply Company, also for shipment to Mexico. Another is of a 20-in. single gear machine to a Detroit party.

The Cincinnati Punch & Shear Company recently shipped to the Cooper Safe Company, Hillsboro, Ohio, a small double power punch and shear machine; Hallidie Machinery Company, Portland, Ore., double 36-in. punch and shear, weight 16,000 lb., which was accompanied by a wheel press from the Niles Tool Works Company; 36-in. throat single punch for export; one single 12-in. machine, Aiken Engineering Company, Winthrop Harbor, Ill.

A new building of the Byesville Foundry & Machine Company, Byesville, Ohio, was blown down recently during a severe storm which destroyed considerable property in that part of Ohio. The machinery had not yet been installed.

Middletown, Ohio, manufacturers have recently organized the Tennessee Metal Culvert Company.

Philadelphia Machinery Market.

PHILADELPHIA, PA., June 30, 1908.

New business has hardly been as plentiful as in preceding weeks. The trade, however, about holds its own and looks at the situation encouragingly, as, even in good years, a decline in buying is generally noticeable at this season, when semiannual stock taking is the usual order. While plants will not be shut down for repairs as extensively as customary, owing to the diminished pressure which has prevailed, there will nevertheless be the same tendency to withhold business until after the turn of the half year.

Both manufacturers and merchants have been giving the Atlantic City conventions of the Master Car Builders and Railway Master Mechanics a good share of their attention the past week, and other business has probably not been pushed as hard as is customarily done. With these conventions over, more attention will be given to the general trade, which, it is expected, will result in an increased number of orders. The conventions and the exhibits of railroad shop tools and appliances were very largely attended, and will, it is believed, result in a satisfactory volume of business later in the year. Encouragement is taken from the expressions of the railroad people, and while those from the Western roads are expected to come into the market first, some fair business is looked forward to later in the year from the local roads.

Manufacturers generally report no change in the general situation. Orders are confined to single tool propositions, mostly of the smaller and medium classes. There have been a few more orders about for special metal working tools, but the demand for general equipment is still quiet. Makers of the larger machine tools report no particular improvement in the demand, buying being pretty well scattered. Inquiries are hardly as plentiful as they were, although it is said that in a number of instances it is to be noted that they lead up to orders somewhat better.

While some little improvement has been noted in the foreign demand, little business has come to this section. Such as has been placed has been largely in the nature of special tools. Those transacting an established business abroad in power transmission specialties report only a fair volume of business.

Second hand machine tools continue in comparatively

good demand. A fair volume of inquiry is reported, and while sales have been largely of the single tool variety, the aggregate volume of business is regarded by the trade as quite satisfactory. Both metal and woodworking machinery as well as tools of a somewhat special nature appear to be in equal demand, while there is also a fair inquiry reported for power equipment specialties. Engines and boilers, particularly those of the smaller horsepower, are not extensively inquired for, although a fair amount of business is still being done in medium horsepower. A moderate business in new engines and boilers is being transacted, some of which run up into the higher power equipment.

Spasmodic improvement is noted in the foundry trade. Some of the steel casting plants report a better run of orders, but there is no disposition to enter any large contracts or buy for forward shipment. A few of the gray iron foundries report an increase of orders, but the business is still somewhat irregular. Jobbing foundries are not very active, and dependent almost entirely on current week to week business.

Percy A. Kley, 1535 Chestnut street, Philadelphia, engineer in charge of construction of the new plant building for the E. J. Schwartz & Bros. Company, Newark, N. J., will take bids at an early date for equipment required, included among which will be a 40 kw. direct connected electric generator and engine, a 100-hp. return tubular boiler, two large electric or hydraulic freight elevators, and general fertilizer manufacturing apparatus.

The Board of Water Commissioners, Reading, Pa., will receive bids until July 10 for the construction of a number of Bernhart filters. Specifications may be had by applying at the office of the superintendent and engineer, Emil L. Neubling, Reading, Pa.

The receiver of the Neafie & Levy Ship & Engine Building Company will offer at public sale July 28 the real estate and equipment of the plant, including foundry, machine shops, boiler shops, storage and warehouses, dry docks, wharves, tools, &c. The plant has been operated by the receivers for several years, and efforts will be made to sell it as a going concern.

The West Philadelphia Stock Yards Company is having estimates made for the erection of a two-story packing plant, 60 x 192 ft., at Thirtieth and Arch streets.

Edward Fay & Sons have been awarded the contract by the Philadelphia & Reading Railway Company for a car cleaning plant, to be erected at Broad street and Lehigh avenue. This work is in connection with the elevation of that company's tracks on Ninth street, and consists of the construction of water, steam and air pipe lines and the erection of a paint shop, blacksmith shop, power house, stove house, coal trestles, &c.

The Light House Engineer, Wilmington, Del., will receive bids until July 10 for furnishing the metal work superstructure for a lighthouse to be erected at Elbow of Cross Ledge Light Station, in Delaware Bay.

The newly constructed machine shop of the Taylor Iron & Steel Company, High Bridge, N. J., was dedicated with appropriate ceremony, under the auspices of that company and the Board of Trade of High Bridge, N. J., Saturday, June 27. Charles W. Summerfield, secretary of the Merchants' & Travelers' Association, Philadelphia, was one of the prominent speakers.

New England Machinery Market.

WORCESTER, MASS., June 30, 1908.

While more machinery was disposed of the past week than in the week preceding, the orders were not numerous nor large. The continuous hot weather is having its effect, adding to the prevailing dullness. Sales are for the most part confined to second-hand machines. Even inquiries for new tools are not brisk. Prospective buyers are apathetic, there being no immediate necessity for placing orders, and there is the other element, the hope that a general systematized reduction in prices of machinery will be made by the manufacturers, or that a break in the market may follow price cutting. Both possibilities seem remote, for the machine tool builders are not considering a change in their lists, and there is no evidence that prices are being shaved or that there is an inclination to make other than trivial concessions to customers.

Veteran observers call attention to the fact that, in spite of months of poor business and the general belief that no important change for the better need be hoped for before autumn, there prevails a pronounced degree of cheerfulness among manufacturers and merchants. This is in marked contrast to the mental depression that has been strongly in evidence in all other similar periods of industrial inactivity in the United States. This is explained by the fact that business houses are entrenched behind a financial strength sufficient to meet a drain on resources, and that they believe the underlying conditions of the country are sound and there-

fore promising of a change for better things in the not too distant future. Collections are improving and may be termed fair. The money market is easy, and the stock market has signs of strength. Incidentally it may be stated that some business men look to the stock market to act as the force which will give the required impetus toward a return of the sort of general confidence which will mean the resumption of buying in every branch of business. The crop outlook loses nothing of its brightness. General business continues to improve in spots, though it must be added that the improvement in some quarters is to an extent counteracted by decreased production in others. The transportation companies are busier than they have been. This applies not only to the railroads and steamship companies, but also to those concerns which do transfer and other hauling in the cities. In Boston there are not nearly so many idle horses as there were a month or two ago.

The Watertown Arsenal will buy some machinery soon, but the list will not be a long one, and will consist principally of inexpensive tools. It is also likely that the Charlestown and Portsmouth navy yards will be in the market to a small extent. Nothing will be done in the way of Government buying, however, until funds included in recent appropriations become available. Work at the navy yards is very dull, there being a noticeable difference from last year, as was expected when the Atlantic fleet sailed for the Pacific, and consequently there is no great demand for general supplies. Nevertheless the influence of the navy upon New England business is by no means a small one at this time, and emphasizes the fact, often discussed by manufacturers and dealers, that a large navy has a very important place industrially. Not only are the Government works affected, but the shipbuilders at Bath, Maine, and Quincy, Mass., are active buyers because of the Government work in the yards. This is especially true at Quincy, where the Fore River Shipbuilding Company is very busy, as is emphasized by the occasional purchase of machinery and other equipment. Besides the work laid down, including the 20,000-ton North Dakota, the construction of eight steel tugs for the War Department is about to begin. The work on the North Dakota is being rushed at a rate never equaled in this country, it is claimed, the ship being three months ahead of a schedule that was itself without precedent for time on this side of the Atlantic. A great deal of satisfaction is expressed in New England over the performance of the scout cruiser Salem, which is equipped with the strictly American Curtis steam turbines. While full information is not available it is known that the hour record of 26.885 knots was made, at least equaling that of the sister ship, the Chester, which has the Parsons turbines. The coal consumption tests, though not yet finished, are believed to be entirely favorable. Two 12,000-hp. Curtis turbines, building by the Fore River Company for a Japanese cruiser, are being tested, and so far as reported have come up to the full expectations of their designers.

The pressed metal manufacturers report that their business is improving, the change being quite marked in some instances. This trade gets its business from a wide variety of industry, and is also close to the consumer with many of its products, so that it responds quickly to whatever improvement may come to many other branches of manufacturing. At present figuring is close and competition keen, but the volume of business compares favorably to that of other metal lines. In fact, there has been less serious depression in this trade than in most others. Some of the pressed steel people have been increasing equipment, and others are planning for a larger or more diversified capacity.

The present car barns of the New York, New Haven & Hartford trolley system at Bridgeport, Conn., have been sold to form a part of the site for the new plant which the Remington Arms Company proposes to erect in that city in preparation for removing the industry from Ilion, N. Y., according to a Bridgeport dispatch. The trolley company will erect a new barn to cost \$250,000, which will doubtless have the usual equipment of machinery for repair purposes.

A project is on foot in Boston to build a gigantic industrial building, plans for which are being prepared by H. L. Gilman, 46 Corn Hill, Boston. The purpose is to provide 3,000,000 sq. ft. of manufacturing space for rental. This would mean very large power plant requirements, and large amounts of other equipment which must form a part of the conveniences of the modern building of the type.

The Union Hardware Company, Torrington, Conn., has increased its capital stock from \$150,000 to \$600,000.

The Narragansett Machine Company, Pawtucket, R. I., is erecting an addition to its machine shop building, 50 x 100 ft., and two stories. The new space is not required for the immediate needs of the business; extension is following out the policy of the company in separating its departments as they grow and to make preparation for the time when greater facilities will be required.

The Mattatuck Mfg. Company, Waterbury, Conn., manufacturer of furniture nails, is to erect a four-story brick building, 42 x 148 ft., to be used for shipping, packing and storage.

The Clark Castor Company, Plainville, Conn., is erecting

an addition to its factory that will have a little more than double the present floor space. The building will be of brick, two stories, with concrete flooring and fireproof construction.

The business and equipment of the Elmore Mfg. Company, Southington, Conn., have been purchased by new interests, which have incorporated as the Elmore Tool Mfg. Company and moved the business to Hartford, Conn., where the headquarters will be located. The factory will be at Weathersfield, a suburb of Hartford, where a complete plant containing 25,000 sq. ft. of floor space has been occupied. The new company will continue the manufacture of the same line of goods, including machinists' and carpenters' tools, screw drivers, nail sets, punches, awls, screw driver bits and cold chisels, but will make the product more complete and will manufacture on a much larger scale. The authorized capital stock is \$100,000, of which \$25,000 will be issued immediately. The incorporators are Charles C. Merri-dith, Clarence I. Hills and William S. Corning, all of Hart-ford.

James E. McWilliams & Son, Hubbardston, Mass., will build an addition to the building occupied by their automatic fire extinguisher department, to be 24 x 30 ft. and two stories. Additional water or steam power will be installed for the purpose of running additional machine tools. The firm will do work which is at present done by outside parties. The firm states that it is not in the market for equipment at the present time.

The New York, New Haven & Hartford Railroad will build a new electric line from Willimantic to South Cov-entry, Conn., through the town of Mansfield. The railroad has changed its decision to dispose of its Connecticut electric lighting, gas and power interests, it is stated. These prop-erties were acquired with the purchase of electric railroads, and it was not deemed wise to continue to operate them, but they have been found profitable. They were formerly owned by the Connecticut Railway & Lighting Company, which covered an important section of the southerly part of the State.

St. Louis Machinery Market.

St. Louis, Mo., June 29, 1908.

The metal working machinery merchants, while reporting some improvement in inquiries and in the outlook, are not effecting many sales. As this is the dull season, however, they are not surprised at the lack of demand. Dealers in shoe machinery state that business is within 20 per cent. of last year, covering the past six months. Special machinery tools are in fair call. There is a fair demand for presses and dies for sheet metal. Manufacturers of saddlery hardware are entering upon the usual dull season.

Boiler makers report business somewhat better, and numerous inquiries render the outlook encouraging. The principal manufacturer of stencil machinery states the de-mand has materially improved. In woodworking machinery conditions continue favorable. Manufacturers of plumbing material report doing within 25 per cent. of last year, and state that collections from railroads have improved.

Government Purchases.

WASHINGTON, D. C., June 30, 1908.

Schedules have been sent out covering class 1, one 5 ton electric pillar crane for the Mare Island Navy Yard, bids for which will be opened July 7.

The Depot Quartermaster of New York will open bids under abstract 4716 for the following machines for Camp Keithley, Mindanao, P. I.: Three arbor steel lathes, one gasoline engine, one swing lathe, &c.

Sealed proposals will be received at Fort Terry, N. Y., until July 18, for a 50-hp. boiler.

The following bids were opened June 15 for electric light equipment for Jefferson Barracks, Mo.:

Item 6, boilers.—Bidder 17, Erie City Iron Works, Erie, Pa., \$12,446; 19, Heine Safety Boiler Company, St. Louis, Mo., \$13,645; 20, Babcock & Wilcox Company, New York, \$12,832.

Item 7, engine.—Bidder 17, Erie City Iron Works, Erie, Pa., \$6896; 21, A. L. Ide & Sons, Springfield, Ill., \$7107; 23, Ridg-way Dynamo & Engine Company, Ridgway, Pa., \$8585; 24, Harrisburg Foundry Machine Company, Harrisburg, Pa., \$9375; 25, Ball Engine Company, Erie, Pa., \$11,357.

Item 8, dynamos.—Bidder 9, Westinghouse Electric & Mfg. Company, Pittsburgh, Pa., \$9949; 10, Fort Wayne Electric Works, Fort Wayne, Ind., \$9475; 12, Western Electric Com-pany, New York, \$11,625.

The following bids were opened June 22, Circular No. 445, for supplies for the Isthmian Canal Commission:

Class 1.—Six air motor generator blasting sets.—Bidder 21, Detroit Hoist & Machine Company, Detroit, Mich., \$1950, ac-cepted.

Class 2.—Pneumatic geared air hoists.—Bidder 16, Chicago Pneumatic Tool Company, New York, \$1067; 21, Detroit Hoist & Machine Company, Detroit, Mich., \$999.50; 40, Ingersoll-Rand Company, New York, \$1015; 58, Manning, Maxwell & Moore, New York, \$1147.30; 78, Shepard Electric Crane & Hoist Company, Montour Falls, N. Y., \$1147.50; 83, South Park Mfg. Company, Port Huron, Mich., \$981.65.

Class 3.—Six roller bearing geared ratchet screw jacks.—Bidder 13, Buda Foundry & Mfg. Company, Chicago, Ill., \$356.40; 29, George S. Fowler, Washington, D. C., \$435; 58, Manning, Maxwell & Moore, New York, \$559.50; 63, Motley, Green & Co., New York, \$360; 101, Atlas Export & Trading Company, New York, \$450.

The following bids were opened June 23 for supplies for the navy yards:

Class 149.—Pneumatic drill and pneumatic calking hammer.—Bidder 26, Chicago Pneumatic Tool Company, New York, \$105; 61, Helwig Mfg. Company, St. Paul, Minn., \$83; 67, Ingersoll-Rand Company, New York, \$87; 68, Independent Pneumatic Tool Company, Chicago, Ill., \$86; 113, Rawles-Cobb Company, Boston, Mass., \$82.30; 132, Standard Railway Equip-ment Company, St. Louis, Mo., \$109.

Class 152.—One-valve reseating machine.—Bidder 17, Central Metal & Supply Company, Baltimore, Md., \$325; 46, R. W. Geldart, New York, \$325; 63, Handlon-Buck Mfg. Company, St. Louis, Mo., \$325; 73, Knox & Bro., New York, \$325; 83, Man-ning, Maxwell & Moore, New York, \$325; 84, Montgomery & Co., New York, \$325; 85, Manhattan Supply Company, New York, \$325; 116, J. B. Roach, Brooklyn, New York, \$325; 126, Sherman-Brown-Clements Company, New York, \$325; 135, Tucker Tool & Machine Company, New York, \$325; 148, Ex-celsior Equipment Company, Pittsburgh, Pa., \$325.

Bids were opened June 24, Circular No. 444, at the of-fice of the Isthmian Canal Commission for furnishing under class 1, boiler equipment for power plant to be erected at Gatun, and under class 2 a duplicate thereof to be erected at Miraflores, as follows:

The Babcock & Wilcox Company, New York, class 1, \$83,396, alternative bid \$83,111.30, delivery Colon or Cristobal; class 2, original and alternative bid same as class 1.

Central Metal & Supply Company, Baltimore Md., part bid; bid submitted on items 2, 3, 4, 5, 6, 7 and 16, total \$13,970.

C. L. de Muralt & Co., New York, class 1, alternative bid \$82,500; class 2, same bid as class 1.

D'Olier Engineering Company, Philadelphia, Pa., class 1, alternative bid, \$56,620; class 2, alternative bid same as class 1.

A. D. Granger Company, New York, class 1, \$76,490, alterna-tive \$75,806; classes 1 and 2, \$82,099, with an alternative of \$81,415.

Heine Safety Boiler Company, St. Louis, Mo., class 1, al-ternative bid, \$62,591; class 2 is same bid.

Merrill Company, Boston, Mass., class 1, \$74,857, alternative \$74,057; class 2, same bids as class 1.

The following bids were opened May 22, for installing boiler plant in United States Post Office, Boston, Mass.:

C. H. Sanborn, Boston, Mass., \$21,872; Bradlee & Chatman Company, Boston, Mass., \$26,387; Lynch & Woodward, Boston, Mass., \$28,970; Merrill Company, Boston, Mass., \$27,400; Wal-worth Construction & Supply Company, Boston, Mass., \$24,962; English & Flett, Inc., Boston, Mass., \$23,333; Cleghorn Com-pany, Boston, Mass., \$23,800; Lumsden & Van Stone Company, Boston, Mass., \$27,600.

Bids were received June 18 by the superintendent of construction, National Museum Building, for furnishing en-gines and dynamos, as follows:

Item 1, engines; 2, dynamos; 3, alternate No. 1 for tur-bines, using 150 lb. steam pressure; 4, alternate No. 2 tur-bine, 100 lb. steam pressure.

Ball & Wood, Elizabethport, N. J., item 1, \$16,500; Provi-dence Engineering Works, Providence, R. I., item 1, \$15,000; 2, \$9800 and \$9700; Wallace Stebbins & Sons, Baltimore, Md., items 1 and 2 combined, \$24,533 and \$25,462; Ridgway Dynamo & Engine Company, Ridgway, Pa., item 1, \$9848; 2, \$10,770; General Electric Company, Schenectady, N. Y., item 2, \$9595; 3, \$19,040; 4, \$19,040; Westinghouse Electric & Mfg. Company, Baltimore, Md., item 2, \$8795; Chase Engine & Mfg. Company, Mattoon, Ill., item 1, \$12,500, or for a four-valve type of engine, \$12,750; Burke Electric Company, Erie, Pa., item 2, \$8970; Ball Engine Company, Erie, Pa., item 1, \$13,817; Northern Electric Mfg. Company, Madison, Wis., item 1, \$11,340; 2, \$9550; 3, \$13,475; 4, \$13,475. Alternate under item 1, \$16,950 and \$16,850. Alternate under item 2, bidder's specification, \$8660 and \$13,400.

The following awards have been made for supplies for the Isthmian Canal Commission, bids for which were opened May 4, Circular No. 436:

Fox Bros. & Co., New York, class 6, one 18-in. engine lathe, \$694.

Vandyck-Churchill Company, New York, class 7, one bench speed lathe, \$60; class 8, one bolt cutter, \$732; class 11, one hack saw, \$33.

Manning, Maxwell & Moore, New York, class 9, one upright drill, \$642; class 30, one blower, \$47.52.

C. T. Patterson Company, New Orleans, La., class 10, one 24-in. shaper, \$642.

Fairbanks Company, New York, class 12, one duplex emery grinder, \$281.

Under bids opened June 8, Circular No. 442, for ma-chinery for the Isthmian Canal Commission, the Western Electric Company, New York, has been awarded class 13, two motors, \$583.20.

Under bids opened June 15, Circular No. 443, for sup-plies for the Isthmian Canal Commission, the International Electric & Engineering Company, New York, has been awarded class 3, one hand planer and jointer, \$164.45; class 4, one universal saw table, \$188; class 5, one band saw, \$85.25.

Under bids opened June 16 for supplies for the navy yards, the Lincoln Electric Company, Cleveland, Ohio, has been awarded class 81, four induction motors, \$1600.

The General Fireproofing Company, Youngstown, Ohio, has reduced wages of all officials and employees 10 per cent., dating from July 1.

HARDWARE

THERE are many indications that in the strife for international trade the governments of the great competing industrial and commercial nations are more and more taking a hand. It is coming to be looked upon as one of the functions of government not only to protect its citizens in their dealings with foreign lands but to foster and facilitate foreign trade in many ways. The frank admission of a great English statesman that the British Empire is maintained for the sake of the trade with its colonies and the designation of the Union Jack as a commercial asset is a picturesque expression of a principle which is influential in countries which have not yet carried their commercial relations so successfully to the ends of the earth. Recognizing its need of foreign markets and having full faith in its ability to supply them, the United States is increasing its efforts to further in any way in its power the interests of its manufacturers and merchants who are in a position to do an export business. Its chief activity in this work is through its consular service to the improvement of which attention has recently been given, but the extension of foreign trade is also under the care of the Department of Commerce and Labor, whose intelligent co-operation may be counted on. The problem is, however, a complicated one, invested with peculiar difficulties, and it is for manufacturers to suggest, if they can, the manner in which the department can be of practical use to them.

In this connection the statement made by the chief of the Bureau of Manufactures as referred to in another column will be of interest. There is a frank recognition of the fact that the Consuls cannot be expected to give expert attention to the interests of manufacturers in the countless lines which seek foreign sale. The experiment is gradually being made of sending out special agents, each of whom is an expert in an important line. These special agents are charged with gathering information in regard to market conditions, trade opportunities and information generally which will be serviceable to those in the line of business directly concerned. This is unquestionably working along right lines. Such information, if reliable and practical, will undoubtedly be useful, and indeed has already been found to be valuable and the means of establishing and broadening business relations. Apart however from this, it will undoubtedly result in obtaining through official channels a greater familiarity with general export requirements and in learning what needs to be done, as, for example, in the matter of finance and shipping, to facilitate American trade with foreign countries. That the former inadequate appropriation for this service should have been cut down to the meager sum of \$40,000 for the current year is a reproach to a Congress all too lavish in other directions.

Condition of Trade.

There is a marked contrast in the conditions which prevailed a year ago and those under which we now enter upon the second half of 1908. In July, 1907, merchants and manufacturers were congratulating themselves on the exceptionally satisfactory six months with its great volume of business, a special feature of the situation being the number of unfilled contracts on the books. There

were then to be noted only occasional and uncertain indications that a slackening of the pace might be expected. The present July opens also with reasons for regarding the half year past with satisfaction, not so much on account of the volume of business transacted as of the dangers which have been escaped and the fair movement of merchandise which has been enjoyed. The outlook for the crops, too, appears to be excellent, and the prosperity of the farming communities assured. All this will, little by little, tend to the welfare of the industrial and commercial classes, by whom, however, the benefits will be more slowly and indirectly enjoyed. Several influences continue to contribute to moderate movement in trade channels. The effects of the financial disturbance are not entirely over-past. There is a general prevalence of a spirit of economy. Labor, especially in the manufacturing towns, is not fully employed. Prices are continuing downward rather than upward. The impending Presidential election distracts the attention and energies of many persons. There is, however, a fair business doing and along reasonable and healthful lines. Things are certainly improving, with the prospect of better conditions, commercial and industrial, it is hoped before long.

Chicago.

In its general aspect trade in Hardware lines has undergone no marked change in the past week. In some of its branches, however, there have been movements of a somewhat more pronounced character in the direction of improved demand. This is particularly noticeable in Haying Tools, orders for which are quite gratifying, both in number and volume. An exceptionally bountiful hay crop is, of course, the immediate cause for activity in this direction, and it is the more important because it is not confined to any one locality, but, on the contrary, is extended impartially throughout all hay raising districts. Though it is a condition that exists in few, if any, other lines, it is nevertheless true that manufacturers of Haying Tools and equipment are enjoying a demand for their product that is in excess of that of last year at this time. Another feature of interest in this connection is the development of a heavy demand for Bale Ties. An abundant hay crop does not of necessity signify a correspondingly increased use of Bale Ties, nor, on the other hand, does a short crop necessarily mean a curtailment of requirements. The quantity of Bale Ties used in any season is largely dependent on the price of hay and the conditions that govern its consumption in home or distant markets. When the crop is scanty in some localities and plentiful in others better prices are realized by baling for shipment, which naturally augments the demand for Ties. This year the yield is not only generally large, but prices are attractive enough to permit of shipment to outside markets. As was the case last year, belated orders for Wire Cloth and Poultry Netting are coming into the market, though in quite moderate volume. Buyers of Wire and Wire Nails continue as before to order what they need and as they need it. This practice, which at the present time is recognized as a commendably conservative course, gives a pretty accurate idea of the actual rate of consumption. The statement, therefore, of leading jobbers that the number of Nail orders coming in, though less in volume, is greater than at this time last year indicates a healthful condition, since it represents the actual assimilative powers of the country. Continued favorable reports concerning growing crops and the safe harvest of maturing ones are exerting a powerful influence in behalf of a restoration of confidence, which finds expression in a more optimistic sentiment in all lines of trade. If the impulses back of commerce and manufacture were backed by the material

prosperity spreading over farm and field, dull times and depression would soon be forgotten themes. As it is, the strength of the latter must reflexively lend substantial aid to the former interests.

Boston.

BIGELOW & DOWSE COMPANY.—We are having ideal summer weather, and friends arriving from the West and South welcome the delightful change after the excessive heat which has driven them to the seashore to find the comfort denied them at home. While the temperature averages 80 degrees, a gentle easterly wind makes life worth living. The summer resorts are now in full swing, and the prospects are for a rushing business.

The farmers are complaining of the dry "spell," and like the quail are crying for "more wet," but the crowds attending Harvard class day and the various excursions arranged for the convention of club women the past week were made very happy.

Politics as yet has had no influence on the trade for better or for worse. People seem to be waiting the result of the Denver convention, but rumor tells us of the plans of the large manufacturing interests to start mills on full time at full wages, feeling that the working man with a "full dinner pail" will be more inclined to vote for a continuance of the old than try any experiments with a new party, however rosy their promises may be.

We hear of increased business since the late revision of prices by the Steel interests. When asked how soon there would be a further decline in Wire Nails, the general sales agent of the largest interest replied, saying "The price as it stands to-day is fixed for the fall," so we feel that they will go no lower, but may reach a higher level later.

General business is good, and the comparison with last year for the month is more favorable. There is a general opinion that we have to look forward to a gradual improvement in business conditions, and that the year will close with a much more satisfactory showing than any one could possibly have hoped for a few months ago. Remittances are really good and stocks are light.

Cleveland.

W. BINGHAM COMPANY.—Trade conditions are just about the same as they were two weeks ago when our last letter was sent to print.

Surely, this has been a great year for political conventions; the Socialist party held their convention at Chicago in May, the Republican convention was held in June at Chicago, the Democratic convention will convene at Denver in July, and Hearst's National party will have their gathering at Chicago in July. However, politics are something that the business man likes to cut out of his category. A real business man minds his own business, "saws wood" and tries all he can to put everybody on "Prosperity Road."

Our National Agricultural Department says to the world that the outlook for another bumper crop for the farmers is excellent. Just think of it, for the last eight years the farmers have enjoyed unprecedented prosperity, and everything points to a splendid harvest for the ninth year. Surely the good Lord has made His face to shine upon our beloved country, and all of us ought to humble ourselves and offer up thanks for the great benefits that we have had and are receiving, despite the adverse legislation and muck raking that business men and railroad companies have been obliged to come up against; but they are going to assert themselves and will come off more than conquerors.

It has been truly said that the railroad companies have been governed within an inch of their lives. We are all glad to know that there is a letup, for we were afraid if the drastic measures and immoderate talk that has been indulged in by so many demagogues and politicians were kept up it would not be very long before our laboring class would feel the effect of this "cat hauling" in the reduction of the wage scale. No manufacturer or business man desires at any time to curtail labor or cut wages, and that only comes as a last resort.

At this time of the year almost every one now is thinking of taking a summer vacation in a way which is

most pleasing to him; some go fishing, some go sailing, others go abroad, some others stay at home and get acquainted with their families, and a good many other ways of resting up are indulged in. May the outings be pleasant and agreeable to all of our friends, and enable them to return to business in midsummer or fall with renewed energy.

The general Hardware trade is very fair at this time of the year. We believe the last six months of this year will be more cheerful and prosperous to all of us than the first six months. Merchants are getting over the skittish idea of buying future goods, and are placing orders now for seasonable goods, such as Coal Hods, Stove Boards, Elbows, Axes, Husking Tools, Skates, Sleds, Registers, Lanterns, Meat Stuffers and many other fall goods. There is considerable inquiry now as to what can be done on goods for spring shipment. Uncertainty of prices is wearing off, and there is a better feeling all around; at least we find it so in this "neck of the woods" and in other sections that Cleveland jobbers draw trade from. As we have five large Hardware jobbing houses in this city, we claim to be the center of the Hardware trade in the United States of America, where many railroad, trunk and water lines radiate, making Cleveland a splendid distributing point.

St. Louis.

NORVELL-SHAPLEIGH HARDWARE COMPANY.—The rains have ceased, the rivers are receding and good corn growing, hot weather is with us. Orders are larger and more numerous. Mail orders show an increase over last year. The daily sales in June, in dollars and cents, show a considerable increase over April and May.

We have received more new stock orders in June than any month this year. These orders are not from any one particular section, but from the various parts of the country, one handsome new stock coming from as far East as the State of Virginia. These practical things indicate that times are better.

The writer has the pleasure of discussing the situation with manufacturers and retailers every day. Many of these visiting manufacturers state frankly business with them in June has not been good. Reports from retailers vary according to the locality in which they are doing business.

In the mind of the writer there is no question but that business, generally speaking, here in the West is steadily improving. This does not mean jobbers or retailers are going to place extravagant orders. A broken stock and a steady pressure for goods will compel the jobber to buy. As the pressure continues and the demand becomes more insistent he will naturally grow less conservative in his buying.

Here is a little suggestion to jobbers that is worth something: Have carbon copies made of the shortage slips sent your customers. Have the profit figured on the shortage slips and see how much you are losing every month by being out of goods. Try this one month, and may be you will take the lid off your buying department.

The greatest one loss in any business is caused by the goods we sell and then leave off the order. It costs as much to sell and it costs more to handle such orders in the house than if the items were filled complete. You have all the expense without any compensating profit.

Not only this, but the items short delay the filling of your orders, not to mention the dissatisfaction caused your customers with possible loss of trade.

We jobbers never know how much business we lose from one cause or another:

A retail merchant sends an order, especially one particular item. His jobber is short that item. This is the straw that breaks the camel's back. He turns his trade to some other jobber.

The collection department calls for a remittance in a letter that lacks in courtesy and friendliness of expression.

The claim department tells a good customer to look in the straw for the lost Wheelbarrow.

The proper handling of all these and many more details goes toward the making up of "good service," and the lack of them leads to a falling off in trade.

To keep a business in live and in good condition means

a constant fight all down the line on little things. The manager of a Hardware business is constantly reminded that "genius is the capacity for taking infinite pains." The modern idea, however, of executive ability is to get the man who has the genius to take the infinite pains while you go away on a vacation. That is a great kind of ability! Some men work it successfully all their lives. Other men do not seem to have the knack. Probably the trouble with them is they hire the man with genius for infinite pains, but with executive ability also. He is a dangerous man to have working for you—your job is not safe.

Baltimore.

CARLIN & FULTON.—With the thermometer ranging about 90 degrees in the shade, business in July lacks the activity of other months. The farmers have been busy with their hay and wheat harvests which we are glad to report are fine, while the growing crops of cotton and tobacco promise well. Building operations, though somewhat more extended than a few months ago, still are not up to the mark. Purchases by the retail trade continue to be made conservatively, for one reason a lack of demand, and for another reason a desire to see what will be the development of the market during the present month in regard to prices. In a few weeks we look for a good demand for goods to spring up from the cotton States, and as stocks have been depleted for several months, and the necessities of the country are just as great as ever, with no financial panic to be apprehended, and no reason for business depression, we can only look for and expect a good trade, though perhaps somewhat less than that of the last year or two. The slight reduction made in prices of Wire and Nails has so far been followed by no further decline in those commodities, and from all the information that can be gathered no further reductions will be made. While prices in many other lines have been forced up to abnormal figures the costs of Hardware have been kept within reason, and what fluctuations have or may occur cannot affect values very much.

Omaha.

LEE-GLASS-ANDRESEN HARDWARE COMPANY.—This market, including other jobbing centers located on the Missouri River, presents no new or particularly interesting features at the present time. Business during the month of June has been satisfactory, and up to expectations. During the coming 30 days agriculturists will be busy in the fields, harvesting the small grains. Corn looks very well on the uplands, but in the low or flat lands too much moisture has injured the plants as well as retarded their growth, consequently the result may show a shortage in volume of this important cereal. The extent and value of the crops about to be harvested will be the main feature of importance having a bearing on the future trend of traffic, and upon this will largely depend the extent of business during the autumn months. With crops of all kinds in fair supply, coupled with the present remunerative values, a continuance of a very satisfactory volume of business is predicted, and probably assured.

Louisville.

BELKNAP HARDWARE & MFG. COMPANY.—This is strictly the intermediate season between the late spring and early fall business, and is selected by many salesmen who do not wish to be absent from their territories at times when business in volume can be had, as a vacation season. For this reason the natural dullness from the season is emphasized, but the general disposition to rest still lingers in those whose activities make Hardwaremen busy.

There are some signs of awakening interest in the subject of money making among capitalists, large and small, and we incline to the belief that by midsummer this disposition will become much more pronounced. By that time the country at large will begin to make up its mind which way the election is likely to go and be influenced by their hopes or fears, but as the majority of men are inspired by hope rather than fear, it may be presumed

that the guessing will be in the direction of their own views of the political situation.

It must be impressive to Americans with foreign correspondence to realize to what extent business the world over is affected and almost controlled by business conditions in this country, and the realization of this condition should make of us a sober minded and conservative people, fit for the responsibilities that have come to us through our wealth and productive energy.

We have been interested to learn, through foreign correspondents in the Spanish-American countries, in Canada and in European countries that they expect a revival of business "when America gets on her feet." That America will be on her feet in time no one of course doubts, but the guessing match that business men are now engaged in is whether or not any recovery will be manifest before Election Day.

If the condition of crops to date is an indication of fall business, it should certainly not be lacking. While too much rain is reported in the Southwest, the latest news still gives the State of Texas cotton acreage above 102 per cent. and conditions 107 per cent. On the whole the crop news is more than encouraging, with preliminary mutterings about drought and bugs, to which we are accustomed at this season of the year.

Nashville.

GRAY & DUDLEY HARDWARE COMPANY.—There is not much difference in the situation in this part of the country since we wrote you last. Crops in the South are of course, pretty far advanced, and the weather continues to be most favorable, and the crops unless something unforeseen occurs, will certainly be bountiful. The wheat crop in Tennessee is now being harvested, and the weather is ideal for farm work. The farmers are about the busiest people we know, and between gathering their bountiful crops and attending to politics, they have been in a rush for the past few weeks. To-day is the day when the next Governor for Tennessee is to be nominated, and the campaign just closing has been probably the most remarkable and exciting one in the history of the State. The prohibition question is cutting a very large figure, and it looks like that Tennessee will soon join some of the other "dry" States in the South. The campaign has attracted so much attention that it has really interfered with business throughout the State to quite a large extent for the past few weeks. A prominent retail Hardware merchant was in our office a few days ago, and made the remark that he found business was interfering with politics so he had cut out business for a while, and it looks like a good many other merchants throughout the State have done the same thing. Now that it is over, however, and with the splendid crop prospects, we are anticipating a nice volume of fall business. Prices, with a few exceptions, are being very well maintained. The recent slight reduction in Nails and Wire seems to have had very little effect in increasing the volume of business. While the bank clearings throughout the country do not indicate any great improvement in business conditions, at the same time we think that we can see considerable change for the better in the South. The shrewder merchants seem to be coming out of their shells, and quite a good many are taking hold of business with more life and energy than they have done for nearly a year. We notice a disposition on the part of many of the smart merchants to place orders for fall shipment, and quite a number of nice orders are being received for Hardware, Stoves, Saddlery and Cutlery for August and September shipment. Collections are fairly good.

NOTES ON PRICES.

Wire Nails.—There does not appear to have been any falling off in the volume of business, notwithstanding the advanced season. While buyers are not ordering in quantities in excess of actual requirements, they are ordering somewhat more freely. This would indicate an increase in consumptive demand without reference to the recent reduction in price. Quotations for base sizes are as follows, f.o.b. Pittsburgh, plus actual freight to point of delivery, 60 days, or 2 per cent. discount for cash in 10 days:

Carloads, to jobbers.....\$1.95
Carload lots to retail merchants..... 2.00
Less than car lots from mill, 5 cents advance per keg.

New York.—Business from nearby points is showing some improvement, but the volume is still restricted to comparatively small proportions. Orders are confined to medium sized lots. Nails are being held on the basis of \$2.40, in small lots at store, with occasional concessions of 5 to 10 cents per keg.

Chicago.—Last week brought out an aggregate business considerably in excess of recent weeks. It is believed that this showing is due more to the strength of actual consumptive demand than to any effect of the recent reduction in price. While ordering more freely buyers are not extending their purchases beyond the immediate demands of the trade. Besides a fair run of new orders specifications are being offered without hesitation. Prices are, we are advised, being firmly maintained by the leading producers. Quotations are as follows: \$2.13, in car lots to jobbers, and \$2.18 in car lots to retailers, with an advance of 5 cents for less than car lots from mills.

Pittsburgh.—Within the past week or 10 days there has been a notable improvement in the demand for Wire Nails, and the mills are entering more orders and making larger shipments than for some time. As yet jobbers are not inclined to buy in large quantities, but are placing such orders as are necessary to keep up assortments of stocks. Consumption is no doubt getting heavier, and the outlook is good for a moderate volume of business in Wire Nails during the next two or three months. We are advised by the mills that regular prices are being maintained. Quotations for base sizes are as follows, f.o.b. Pittsburgh, plus actual freight to point of delivery, 60 days, or 2 per cent. discount for cash in 10 days:

Carloads, to jobbers.....\$1.95
Carload lots to retail merchants..... 2.00
Less than car lots from mill, 5 cents advance per keg.

Galvanized Nails are quoted at \$1 over the price of the regular Nails.

Cut Nails.—Conditions in the Steel Cut Nail market remain unchanged, demand continuing light and for small quantities. The price for Steel Nails at mill is reported to be a \$1.75 base, with the probability that it would be shaded for desirable orders, small lots being held at \$1.80 to \$1.85, base, at mill. In the Western market Iron Cut Nails are held at an advance of about 10 cents per keg over Steel Cut Nails, but this differential is not observed in the East.

New York.—In the local market the demand for Steel Cut Nails continues to be relatively small. Cut Nails are held on the basis of \$2.15 per keg for small lots at store.

Chicago.—There is no perceptible change in conditions governing the demand for Cut Nails. Orders are still closely limited to present needs, which of course means an extremely quiet movement. Western mills and jobbers claim that prices are generally firm at \$1.80, Pittsburgh, for Steel Cut Nails. We therefore quote Chicago prices as follows: In car lots to jobbers, Iron Cut Nails, \$2.08; Steel Cut Nails, \$1.98. In small lots from store: Iron Cut Nails, \$2.25; Steel Cut Nails, \$2.15.

Pittsburgh.—The market continues extremely quiet, and there is not much encouragement for a larger demand in the near future. Jobbers are placing orders only to cover actual needs, and the amount of new business entered by the mills is relatively small. We quote Steel Cut Nails at \$1.75, at mill, but on a desirable order this price could be shaded. Small lots are held at \$1.80 to \$1.85, at mill. Iron Cut Nails are quoted at about \$1.80, at mill.

Barb Wire.—The amount of new business, received at mills, is naturally light at this season, but is regarded as quite satisfactory considering general conditions. Quotations are as follows, f.o.b. Pittsburgh, 60 days, 2 per cent. discount for cash in 10 days:

	Painted.	Gal.
Jobbers, carload lots.....	\$2.10	\$2.40
Retailers, carload lots.....	2.15	2.45
Retailers, less than carload lots.....	2.25	2.55

Chicago.—Considering the usual dullness of the season business is quite as good as could be expected. New orders are naturally light and of moderate volume, but withal a fair amount of business has been entered in the

past week. We are advised that prices are being regularly held. Quotations are as follows: Jobbers, Chicago, car lots, Painted, \$2.28; Galvanized, \$2.58; to retailers, car lots, Painted, \$2.33; Galvanized, \$2.63; retailers, less than car lots, Painted, \$2.45; Galvanized, \$2.75; Staples, bright, in car lots, \$2.25; Galvanized, \$2.55; car lots, to retailers, 10 cents extra, with an additional 5 cents for less than car lots.

Pittsburgh.—The amount of new tonnage received by the mills is small, as this is the off season in this line and not much business is expected. An improved demand is looked for early in August, when the new season will open up. The mills advise us that regular prices are being maintained. Quotations are as follows, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days:

	Painted.	Gal.
Jobbers, carload lots.....	\$2.10	\$2.40
Retailers, carload lots.....	2.15	2.45
Retailers, less than carload lots.....	2.25	2.55

Plain Wire.—Demand has shown some increase from jobbers and also from manufacturers of Fencing, although nearby requirements are apparently adhered to. Quotations per 100 lb. to jobbers in carload lots are as follows, on a basis of \$1.80 for Plain and \$2.10 for Galvanized, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days, the price to retailers being 5 cents additional:

Nos.....	6 to 9	10	11	12	12½	13	14	15	16
Annealed.....	\$1.80	1.85	1.90	1.95	2.05	2.15	2.25	2.35	
Galvanized.....	2.10	2.15	2.20	2.25	2.35	2.45	2.55	2.65	

Chicago.—Last week's bookings in new orders and specifications by the leading interest showed considerable improvement indicating a more liberal policy in purchasing by jobbers and manufacturers, due partly to the recent price reduction, and doubtless in a large measure to promising crop prospects, Fence makers ordering more freely though not in quantities that represent far ahead requirements. We quote as follows: Car lots to jobbers, \$1.98, f.o.b. Chicago, and to retailers, \$2.05.

Pittsburgh.—The demand continues to show some improvement, and the mills are entering more orders than for some time. Shipments are also better, and the condition of the Wire Fence market is more satisfactory than for several months. The large trade is still inclined to place orders only for actual needs, but the number of such orders is increasing, and the mills expect a fairly heavy volume of business during the next month or two, and a decided gain in tonnage when fall trade opens up. Quotations per 100 lb. to jobbers in carload lots are as follows, on a basis of \$1.80 for Plain and \$2.10 for Galvanized, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days, the price to retailers being 5 cents additional:

Nos.....	6 to 9	10	11	12	12½	13	14	15	16
Annealed.....	\$1.80	1.85	1.90	1.95	2.05	2.15	2.25	2.35	
Galvanized.....	2.10	2.15	2.20	2.25	2.35	2.45	2.55	2.65	

Adzes.—A reduction of \$1 per dozen on all grades of Adzes has been made by the principal manufacturers.

Scythes.—A change has been made in the working arrangement of Scythe manufacturers and notices have been sent out that payment of premiums, &c., through a commissioner have been discontinued.

Hatchets.—There has been a change in conditions affecting the marketing of Hatchets, as hinted in these columns a week ago. Leading manufacturers have reduced their prices about 10 per cent., but their action seems to have been a concerted one, and the market retains an appearance of regularity. A discount of 40 and 12½ per cent. may be named to represent the new level of prices, with additional discount as before to large buyers. Broad Axes, which are affected by the same condition, may be quoted at the same discount as Hatchets. On second quality goods the corresponding discount is 50, 10 and 5 per cent.

Lawn Mowers.—As the time approaches when manufacturers of Lawn Mowers are usually soliciting contracts for the succeeding season, the question is raised whether declines which have taken place in iron and steel will be reflected in quotations on these machines. Such changes, if they occurred, would probably be most noticeable on the cheaper grades, but manufacturers are

quite positive in the assertion that reductions may not be expected. For some years they have, owing to keen competition, made prices on low grade Mowers which have often been unremunerative, and have not reflected increased productive costs as have most other lines of goods. Last year a moderate advance was brought about, but this was apparently imperative and scarcely made the manufacturers whole on their low priced output. Thus it is argued that the decline in iron offers no good reason for a reduction in the price of Mowers especially as lumber and labor remain as high as ever. Manufacturers are accordingly maintaining last season's prices. The rainy season which has been experienced in most sections of the country has caused an active sale of Mowers, and the trade are pretty well sold out, so that manufacturers feel assured that a good volume of business will be obtainable.

Spooled Wire.—In quoting the market on Spooled Wire a week ago we omitted to name a price on retail assortments, an important feature of this line. A figure of \$2 to \$2.25 per box may be named as representing the market to average buyers.

Corn Poppers.—A reduction of about 10 per cent. in 1-qt. square and 1-qt. round Corn Poppers was made last month by the leading manufacturers. The following quotations may now be mentioned as representing the market in these goods in a general way:

1-qt. square, per doz.,	\$0.80;	per gross,	\$8.75
1-qt. round, per doz.,	0.90;	per gross,	10.00
1½-qt. square, per doz.,	1.20;	per gross,	12.00
2-qt. square, per doz.,	1.50;	per gross,	15.00

Rope.—Manufacturers who are the most aggressive in going after business, and especially those who are exceptionally well equipped for producing certain lines of Cordage, are securing the bulk of orders. This is at best, however, much below the capacity of the plants, buyers keeping their stocks down to the lowest possible limits. The market is not very firm at the following quotations: Pure Manila, 10 cents; Pure Sisal, 7 cents; No. 1 Jute, ¾-in. and up, 5¼ cents; No. 2 Jute, ¼-in. and up, 5¼ cents.

Binder Twine.—During the last week or two there has been some evidence of cutting in prices of ¼ to ½ cent per pound by holders of Twine. The market is, however, referred to as generally strong at the original schedule prices. The demand is confined largely to second orders from territory where harvest is in progress. The grades of Twine which are called for most largely are Sisal and Standard. These are held, respectively, at 8 cents in carloads and 8¼ cents in less than carload lots, central delivery, except by those who are shading prices as above noted.

Paris Green.—Some manufacturers report that they have disposed of their entire production of Paris Green, while others state that the demand has been very satisfactory. The acreage devoted to potato planting in Long Island is exceptionally large this year, and the demand for Green from this section has been active. Quotations are unchanged as follows:

	Arsenic	175	28-56	2 & 5	Boxes.	Boxes.	Boxes.
	lbs.	lb.	lb.	lb.	1-lb.	¼-lb.	¼-lb.
10,000 lb. and over....	21½	22	23	23½	24½	25½	26½
5000 to 10,000 lb.....	22	22½	23½	24	25	26	27
1000 to 5000 lb.....	23	23½	24½	25	26	27	28
500 to 1000 lb.....	24	24½	25½	26	27	28	29
Less than 500 lb.....	25	25½	26½	27	28	29	30

Window Glass.—Hand operated factories are gradually dropping out, and it seems probable that those which will continue in operation after the Fourth of July will not exert much influence on the market. The Eastern Jobbers' Window Glass Association recommend the following quotations: New England and New York Metropolitan District, 90 and 30 per cent. discount for Single, and 90 and 35 per cent. discount for Double Strength; Eastern and Southern States, including the Carolinas, 90 and 35 Single, and 90 and 40 per cent. discount for Double Strength; extreme Southern States, including Florida, Georgia and Alabama, 90 and 30 for Single, and 90 and 35 per cent. discount for Double Strength Glass. According to press reports, a number of Plate Glass factories are about to be closed down temporarily, owing to the light demand and accumulation of stocks.

Linseed Oil.—The market continues quiet, and the demand is restricted to actual requirements. Manufacturing consumers are confining their orders to a carload or less at a time, while the consuming trade is buying in small lots as requirements demand. According to reports, there were about 1,500,000 less bushels of Flax Seed at Duluth and Minneapolis last week than at the same period last year. It is also said that the price of Seed has encouraged an export demand. These conditions are regarded by some as reflecting a strong statistical position in Seed, notwithstanding the limited demand for Oil. Prices for carload lots, especially for Western Raw, are not very firm, as a quotation of 41 cents or less could probably be obtained. Local quotations are as follows: State and Western Raw, 42 to 44 cents; City Raw, 44 to 45 cents per gallon. Boiled Oil is 1 cent per gallon advance on Raw.

Spirits Turpentine.—Supplies have been more than sufficient to meet requirements in the Savannah market during the week, and as a result prices showed some decline. Consuming manufacturers are closing their plants for the annual repairs which reduces the demand to some extent. Present prices are regarded by some as low, while others view the accumulation of heavy receipts at primary points as favoring still further reductions in price. The New York market is represented by the following quotations: Oil Barrels, 41½ to 42 cents; Machine Made Barrels, 42 to 42½ cents per gallon.

White Lead and Oxides.—As a result of the continued upward tendency in Pig Lead, manufacturers of White Lead and Oxides have advanced prices, subject to change without notice, as follows, terms lots of 500 pounds and over, 60 days, or 2 per cent. discount for cash if paid in 15 days from date of invoice:

White Lead.	Cents per lb.
Dry and in Oil, in 100, 250 and 500 lb. kegs.....	7
Dry and in Oil, in 25 and 50 lb. kegs.....	7½
Dry and in Oil, in 12½-lb. kegs.....	7½
In Oil, in 25-lb. tin pails (100 lb. in a case).....	7½
In Oil, in 12½-lb. tin pails (100 lb. in a case).....	8
In Oil, in 1, 2, 3 and 5 lb. tin cans, assorted (100 lb. in a case).....	9
In lots of less than 500 lb., ½ cent per lb. advance over above prices.	
Oxides.	
Red Lead and Litharge, in 100-lb. kegs.....	7
Red Lead and Litharge, in 25 and 50 lb. kegs.....	7½
Red Lead and Litharge, in 12½-lb. kegs.....	7½
In lots of less than 500 lb., ½ cent per lb. advance over above prices.	
Red Lead and Litharge, in bbls. and ½ bbls., same price as in kegs.	

Strap and T-Hinges.—The market for Strap and T-Hinges is regarded with some interest, as there are indications of special concessions or other irregularities in price.

Dripping Pans.—Some of the manufacturers are acting independently and quoting somewhat lower prices than have heretofore prevailed.

At the annual meeting of Louis Hoffman Hardware Company, Vicksburg, Miss., the old officers were re-elected and Louis Hoffman, Jr., was admitted to partnership. The business was founded in 1857, and was organized as a stock company in 1886.

J. L. Osgood, Buffalo, N. Y., has just returned from a two months' European trip. He succeeded in making very desirable connections for the production of Indestructible File and Tool Handles under his patents in England, France, Belgium and Germany.

J. E. Gebhart, Plainville, Kan., who handles Shelf and Heavy Hardware, Stoves, Paints, Implements, Harness, Vehicles, &c., is erecting a new building to be of fire-proof construction, with concrete basement, elevator, Warren shelving, plate glass front and up to date in every way.

The Cameron Hardware Company, Cameron, Texas, has been incorporated with a capital stock of \$100,000, by J. T. Brown, T. E. George and Leonard Brown. J. T. Brown is president of the new company.

Death of Samuel Disston.

SAMUEL DISSTON died at his home in Philadelphia, Saturday, June 27, as the result of a complication of ailments, with some of which he had been contending for several years. In consequence of advanced years and impaired health and strength, Mr. Disston retired from the active duties of secretary and general manager of Henry Disston & Sons, Inc., May 28 last, a position he had occupied since 1894. Owing to Mr. Disston's continuous association with this important industry almost from its inception and in a commanding position, a sketch of his life is, in part, a history of the growth and development of the business with which he had been so closely connected for 58 years and in which he bore so influential a part.

Samuel Disston was born in Nottingham, England, September 15, 1838, coming to the United States in 1850, when he entered the employ of his brother, Henry Disston, founder of the business, where he served an apprenticeship as a Saw maker and gained a general knowledge of the business. After he had mastered the art of Saw making he entered the office and eventually became the selling representative of the firm, traveling extensively, his strong personality, earnest efforts, wonderful physical endurance and complete knowledge of the business winning for him a high reputation. In 1894 Mr. Disston became secretary and general manager of the company, and on retirement from the more active duties a few weeks since, he was elected chairman of the Board of Directors.

When Samuel Disston entered the employ of Henry Disston, in 1850, the whole number of employees was about 35, while now over 3500 are employed, and the extensive plant at Tacony (Philadelphia) covers 50 acres, on which are 54 buildings, branch houses being maintained at Chicago, Cincinnati, New Orleans, Memphis, Nashville, Boston, San Francisco and Toronto, with representatives in many of the large cities of the world. The Laurel street plant, when Samuel Disston was first employed there, had a capacity of 75 to 100 dozen Saws of all classes per week. The site of the present plant was purchased in 1873 and removal to the new works was fully consummated in 1884. The present capacity of the great plant is several thousands of dozens of Saws of all kinds per week.

The Saw industry of Henry Disston had its inception at Front and Laurel streets, Philadelphia, in 1840, when the founder, Henry Disston, constituted the entire "force"—Saw maker, bookkeeper, salesman and proprietor. Immediate success did not come in the competition with Spear & Jackson and other established English makes, despite the fact that the superiority of the Disston Saws to the foreign brands then in demand was recognized by those who compared them. It was only after years of incessant effort and struggle, the surmounting of innumerable obstacles and the overcoming of rooted prejudices against not only Saws but other tools of American origin that success was achieved. Henry Disston, once when asked what he put in his saws, replied: "Good steel and honest work."

With increasing experience in the requirements of Saws, which now are put to greater and more varied uses than formerly, the larger the establishment became the more it was possible to experiment along the lines developed by experience, looking to the betterment of manufacturing facilities, the making of improvements in machinery, methods, processes, &c., as well as increasing the efficiency of the Saw. Invention followed invention, process after process was devised and original ideas tried out. The result has been that Saw making was revolutionized, and a great plant with complete equipment for economical manufacture was an accomplished fact capable of turning out Saws of improved design in greatly increased variety of high quality and superior finish, which work easier, last longer and sell for less than would have been possible under old methods.

All Disston Saws are made throughout in the Disston establishment. The steel itself is made in the Disston Steel Works, under a special formula which insures a raw material peculiarly adapted for Saw purposes. A

complete laboratory is maintained for the making of physical and chemical tests of steel, in order to maintain a high quality, accuracy and uniformity, while in the Saw factory with its numerous departments, each step in the different operations of Saw making is based on methods peculiarly their own, particularly in the operations of hardening and tempering, important details upon which largely depend the life and vitality of the Saw. Of much importance also is the length of the term of service of the large body of Saw makers, the majority of whom have been long connected with the establishment and thoroughly drilled in correct methods.

In the building up of this great establishment Samuel Disston bore a prominent part, giving his attention to practically every detail of manufacture and to a careful consideration of the various problems that came up in connection with the development of the industry along



Samuel Disston

practically new lines. He recognized the value of expert knowledge in the various departments, and thus had the aid of the best ability in carrying out the broad and well devised plans which have always been characteristic of Disston enterprise. He had also exceptional judgment in the marketing of goods and the general direction of the affairs of the corporation. His conservatism and wisdom was repeatedly shown in keeping the prices of the Disston goods on a moderate level, when many jobbing houses were urging the advancing of prices which the market conditions for the time being appeared to justify.

Samuel Disston was a volunteer soldier during the Civil War, and the prominent position he came to occupy in the manufacturing and commercial world doubtless led him into other activities of a public character. He was a director of the Eighth National Bank, Northern Trust Company and Board of Trade, all of Philadelphia; belonged to the Union League Club, was ex-president and director of the Hardware Merchants' and Manufacturers' Association, ex-president and member of the Columbia Club, and previous to a gradual breaking down in health was a member of the Board of Port Wardens of Philadelphia. He had also been a member of the Executive Committee of the American Hardware Manufacturers' Association, and was actively connected with a number of other financial and mercantile enterprises. He had

a wide acquaintance with the trade throughout the country founded on business relations running through a long period of years. While in his death the trade loses one of its leading manufacturers and merchants, there will be a general recognition of the rare energy, wisdom, uprightness and ability that characterized his business career and crowned it with so large a measure of success. He will be held in kindly remembrance by a host of friends who esteemed him in proportion to their acquaintance with him, and the opportunity thus given to recognize the genuine kindness and nobility of his strong and forceful nature. The manner in which during the recent years he contended with failing health brought out conspicuously some of the finer traits of his character.

A set of resolutions expressing deep regret and sorrow at Mr. Disston's death and in which reference was made to some of the features of a long and honorable career, have been adopted by the Hardware Merchants & Manufacturers' Association, a copy of which, suitably engrossed, will be presented to his family. Mr. Disston is survived by a widow, two sons and two daughters.

LETTERS FROM THE TRADE.

Our readers are invited to discuss in these columns questions of trade interest connected with the manufacture or sale of Hardware. We shall be pleased to have a free expression of opinion on subjects deserving the attention of Hardware merchants and manufacturers.

Guaranteeing Iron and Steel Prices.

To the Editor: There is a disposition on the part of all dealers in iron and steel products—Nails, Wire, and Wire Fencing, Metal Roofing, Black and Galvanized Sheets, &c., to insist on manufacturers guaranteeing price against decline. Any one that can read the signs of the times knows that production is far in advance or excess of consumption, the farmer, the contractor, as well as the dealer, holding back for the reason that they feel present values are excessive, based on the capacity to produce goods in iron and steel, on the consumption going on at this time, and on the fact that heretofore the law of supply and demand has governed.

The steel manufacturers have undoubtedly been able to settle the market for the past six, eight, or nine months, and in doing so they have favored the jobber and the retailer who had large stocks of high priced stuff on hand. So far as the steel makers are concerned, they have done their whole duty up to this time.

Matters have now gone along until stocks in the hands of jobbers and retailers have been reduced to a point probably as low as such stocks can be cut without getting entirely out of reasonable assortments, and jobbers and retailers are not unreasonable in demanding that manufacturers guarantee the goods they sell the dealers against further decline to the extent of stock on hand. Guaranteeing against decline on unfilled contracts is not enough.

If the market were an open one and the law of supply and demand governed, the dealer would have more reason to demand contracts other than guaranteeing against decline on unfilled contracts, but the market in its present condition is an unnatural one. If the Steel manufacturers can maintain prices for eight months, and against the fact that consumption was greatly reduced, they can now afford to guarantee their distributors, the jobber and the retailer, against any loss from further decline in price.

The jobber and distributor depend upon the margin allowed them by the manufacturers, and further decline of course would wipe out that margin, which would result in the jobber and retailer working for nothing or less than nothing. On the other hand, the manufacturer on account of the greatly reduced cost of production at this time, and with a wide margin of profit in manufacturing, would lose only a portion of profit that he otherwise would make in case a decline should take place, so that the jobber and retailer are entirely justified in the stand they are taking.

FAIR PLAY.

Carolinas Hardware Association.

THE programme for the annual convention of the Retail Hardware Association of the Carolinas, which will be held at Wrightsville Beach, N. C., on the 7th, 8th and 9th inst., promises a very interesting and instructive meeting. Among the formal papers and addresses will be the following: "How Best to Get Legislation Through," by W. M. Otis, manager Columbia Lumber & Mfg. Company; "Hardware Advertising," by R. D. Baldwin, advertising manager Simonds Mfg. Company, Fitchburg, Mass.; "How to Get Best Results from Our Clerks," by T. W. Dixon, Southern Hardware Company, Charlotte, N. C.; "The National Pure Paint Law," by M. C. Thompson, H. B. Davis Company, Baltimore, Md.; "Hardware Mutual Fire Insurance," by W. P. Lewis, National Hardware Mutual Fire Insurance Company, Huntingdon, Pa., and "Parcel Post and the Retailer," by M. L. Corey, secretary of the National Retail Hardware Association.

AMONG THE HARDWARE TRADE.

Goodloe & Curtis have bought the Hardware, Stove, Tinware and Implement business of D. B. Shackelford & Co., Richmond, Ky.

I. H. & J. H. Hansen, Portland, Ore., have been succeeded in the Hardware, Stove, Paint and Sporting Goods business by H. Hansen & Co.

McCook Hardware Company, McCook, Neb., is building a two-story and basement storehouse, 25 x 80 ft. in size, adjoining its main store.

M. C. Joyce, Syracuse, Neb., has succeeded to the Hardware, Stove, Tinware, Harness, Vehicle and Sporting Goods business of Joyce & Shrader.

The Vick-Jennings Hardware Company has been organized, with a capital of \$10,000, for the purpose of taking over the Hardware, Implement and Vehicle business of Will A. Vick Company, Watertown, Tenn.

M. E. Kirby has succeeded to the business of the Drake Hardware Company in Bolivar, Mo., and will handle Shelf and Heavy Hardware, Stoves, Tinware, Agricultural Implements, Paints, Oils, Sporting Goods and Harness.

AN elaborate programme of entertainment has been arranged for the thirteenth annual picnic of the Chicago Retail Hardware Association, to be held at Northwestern Park on Wednesday, July 15. The annual outing of the organization has come to be an event that is looked forward to by its members with much pleasurable anticipation. Such diversions as dancing, target shooting, games, baseball and the variety of races constitute the special features of entertainment. These sports are arranged and supervised by a Committee of Arrangements, consisting this year of Martin Engelhardt, chairman; A. J. Engelhardt, W. H. Bennett, Fred Ruhling and Carl Herzog, who will be assisted by a number of special committees.

THE address on "The Best Methods of Departmentizing Business and the Benefits to Be Derived Therefrom," delivered at the recent convention of the Southern Hardware Jobbers Association, by S. Norvell, president of the Norvell-Shapleigh Hardware Company, St. Louis, has been issued in attractive pamphlet form for distribution among the trade.

JOHN H. GRAHAM & Co., 113 Chambers street, New York, have been appointed general sales agents for the American Lawn Mower Company, Muncie, Ind. The firm have for some time been export selling agents for this manufacturer, and their success in that quarter has led to the present arrangements, covering both domestic and export business.

Motor Window Display.

THE GEO. T. GADD HARDWARE COMPANY, Cedar Rapids, Iowa, has a spacious and attractive Hardware store with a large and well arranged stock. At the time of the Iowa Retail Hardware Convention in that city, the company's window was dressed with the special Tool display shown in the accompanying illustration. The window is a large one, measuring 15 ft. wide, 7 ft. high

The Central Figure

was a huge display board 6 ft 6 in. square, also covered with red, out of which was cut a 5-ft. wheel, as shown in the illustration. This was mounted on a ball bearing Grindstone shaft, with the ends resting on tripods both front and rear, the long end of the shaft on the front side of the wheel, which would have permitted the display of larger articles on the wheels than are shown.

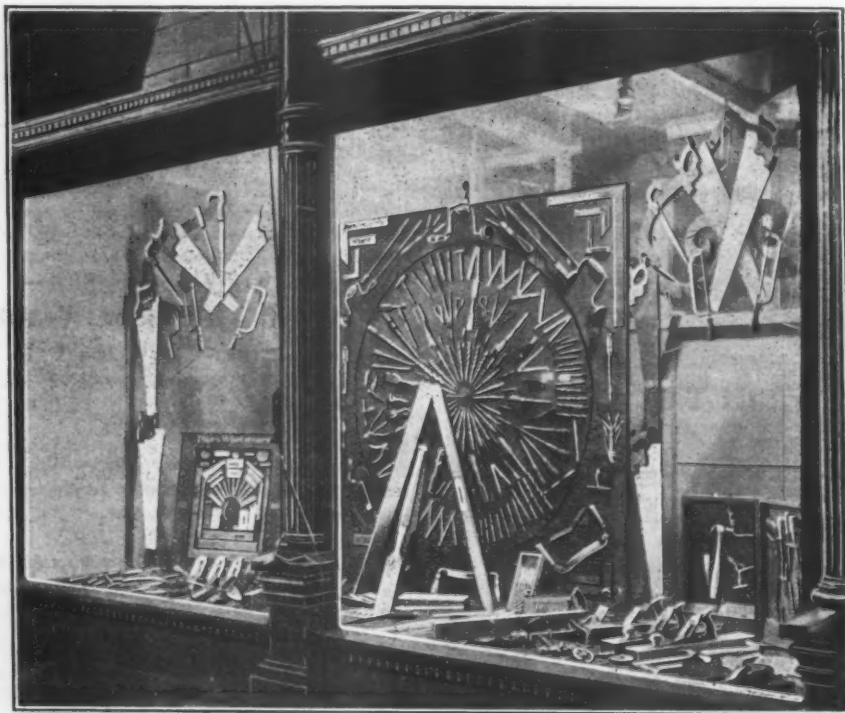


Fig. 1.—Tool Window Display of Geo. T. Gadd Hardware Company.

and 6 ft. deep, so that it accommodated an elaborate layout. In either side of the window upright frames were erected, something like the fleur de lis design and covered with red crepe paper. On these, Saws and other Tools were effectively arranged. A Tool Chest on one

The legs of the front tripod supporting the shaft were concealed by two large Levels and a carpenters' Slick. The wheel was made to revolve by an electric sewing machine motor cleverly harnessed to it, as shown in Fig. 2. The method of operation will doubtless be clear from the diagram, but it may be explained that the motor is belted to a 4-in. awning pulley on the shaft with a 1½ in. awning pulley, the latter being belted to a sewing machine drive wheel on a shaft made of Wagon Box Rod, with a 2-in. side Pulley at the other end. The main drive belt was No. 7 Sash Cord, which ran in a groove cut in the circumference of the wheel. The arrangement of Pulleys reduced the speed of the large wheel to about four revolutions a minute.

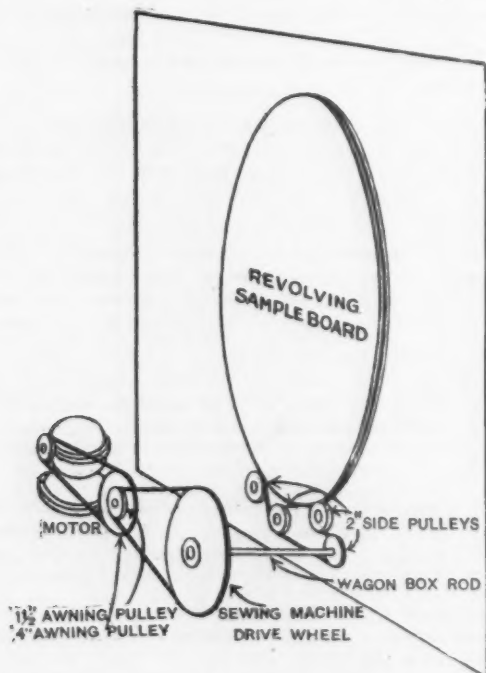


Fig. 2.—Diagram Showing the Operation of the Motor Attachment.

side and a framed Whetstone display on the other formed an upright background on the floor of the window, while Planes, Drills, Hammers, Hatchets, &c., were symmetrically arranged in the foreground.

India Oil Stone Window Displays.

IN the interest of its India Oil Stones and with a view to educating mechanics and others in the large number of different shapes and sizes and demonstrating the kind of sharpening which each is best adapted for, the Pike Mfg. Company, Pike, N. H., has put two men on the road going from one city to another and preparing window displays of the goods in the stores of the company's customers. The company's representative spends a week with each customer, and during this time no effort is spared to advance the mutual interests of merchant and manufacturer. The attractive window exhibits are well advertised in each city or town, and invitations to visit the store are sent to mechanics, whose names and addresses are secured through the local merchant. The company's publicity man also visits the shops and plants in the vicinity, and thus comes into personal touch with the workmen, whose attention is called to the display.

A little booklet has lately been issued by the company, entitled "What Bill Said," in which the efficiency of the coarse India Oil Stones in sharpening Planer Knives without removing them from the machine is enforced. This is also true in the case of many other machine tools, the time required to take them out and adjust them after being ground and put back thus being saved.

STIMULATING EXPORT TRADE IN HARDWARE AND RELATED LINES.

FROM OUR SPECIAL CORRESPONDENT.

WASHINGTON, D. C., June 30, 1908.

THE attention bestowed by *The Iron Age* upon the important problem of the stimulation of our export trade in Hardware and allied lines has brought forth very favorable comment from official experts here and has resulted in offers of governmental co-operation which cannot fail to be of great and lasting benefit. Major John M. Carson, chief of the Bureau of Manufactures of the Department of Commerce and Labor, in an interview with the Washington representative of *The Iron Age*, said:

I have noted with much interest the efforts of *The Iron Age* to arouse the Hardware manufacturers to the importance of developing our export trade, and I wish to extend the assurance through *The Iron Age* that my bureau stands ready to do everything in its power to co-operate with this movement. This branch of the Department of Commerce and Labor was organized chiefly for the purpose of aiding manufacturers and exporters in developing their foreign business, and while of necessity we must work within rather narrow limits, I think I am justified in saying that we have met with a fair measure of success in several important directions, judging by the testimony of those most deeply interested.

Policy of the Bureau.

A brief statement of the policy pursued by this bureau with reference to our trade abroad may be of interest to the readers of *The Iron Age*. Before this Department was organized the efforts of the Government in behalf of American manufacturers desirous of extending their foreign business were limited to directing the consular service in the investigation of trade opportunities abroad, but as our consuls, in the nature of things, can but rarely possess special qualifications for this work the scope of their activities and the consequent measure of their success were necessarily limited. With the development of this bureau was evolved the policy of employing expert special agents, thoroughly competent by reason of their familiarity with certain important American industries to go abroad and gather information regarding openings for American goods that would be of genuine value to our producers. Congress made a modest appropriation for this purpose, and perhaps I can in no way furnish a better basis for a full understanding of the scope of our work than by describing briefly the character of the staff of special agents we now have in the field.

Expert Special Agents and Their Work.

Seven men are now representing this bureau in foreign countries, of whom six have had lifelong experience either directly in the industries which they now represent or closely associated with them, while the seventh is a man of comprehensive experience in many lines which makes him exceedingly useful for general work and in emergencies that are constantly arising.

Foreign markets for American agricultural implements are now being investigated by Roland R. Dennis of Auburn, N. Y. Mr. Dennis is a successful retired implement manufacturer, who has undertaken this work rather because of his interest in the industry than for any pecuniary consideration. His investigation is made from the standpoint of a thorough expert, and the results cannot fail to be of great benefit to the domestic industry.

An exceedingly valuable series of reports upon the machine tool trade of the world is now being received by the bureau from Capt. Godfrey L. Carden of the United States Revenue Marine Service, who has been detailed to this bureau for the special work he now has in hand. Captain Carden has made a lifelong study of American machine tools and is the recognized expert of the revenue service in this line. He will also be remembered as the expert in charge of an important branch of the machinery exhibits at the St. Louis Exposition.

A study of the cotton oil trade of the world is being made for the benefit of the American oil crushers by A. G. Perkins, who for many years was a practical oil crusher and thoroughly familiar with the technical and commercial problems of interest to the industry. His reports have been of great value and are being closely followed by cotton oil men in all sections.

In cotton goods an investigation has been in progress for the past two years, the results of which alone are worth far more than the total cost of this expert service. It has been conducted by W. A. Graham Clark, formerly superintendent of a large cotton mill in one of the leading industrial centers of the South. Mr. Clark's equipment has been unusually comprehensive and his reports have been universally commended by experts.

The flour milling industry is now represented on our staff of experts by M. H. Davis of Shelby, Ill., a practical miller

and president of a well-known milling company. It is hardly necessary to say that the compensation received from the Government by such a man as Mr. Davis is a minor consideration and the industry is very fortunate in being able to secure his services.

Much valuable information regarding the foreign markets for American shoes and leather, especially in the West Indies, has been gathered for the bureau by Arthur Buttman, who has long been identified with this industry.

Our general commercial expert available for almost any line of work is Charles M. Pepper, formerly one of the leading newspaper correspondents at Washington and a conservative, carefully trained observer, whose reports have proven of much value to a number of leading industries.

In the Selection of Nearly All These Experts

the bureau has followed the plan of soliciting nominations from the interested trades. The appointments have thus been taken entirely out of politics and we have secured the services not only of experts, but of men in whom the leading representatives of the several industries have the fullest confidence. It is a matter of genuine regret to me that I cannot hold out to the Hardware trade the hope that the bureau during the coming year will be able to employ a special expert to make an investigation of trade opportunities in this particular line. Congress at its last session, finding it necessary to retrench in some directions, cut our appropriation for the salaries and expenses of special agents from \$50,000 to \$40,000. This will make it necessary for us to dispense with the services of two men and will render it impossible to employ additional experts during the fiscal year beginning July 1. I believe, however, that this work is but just begun, and that with the co-operation of the interested trades I shall be able to induce Congress another year to materially increase our allotment.

Special Inquiries Through Consuls in All Parts of the World.

But while the bureau was thus prevented from assigning a special agent to visit foreign countries in the interest of the Hardware trade, there are other things we can do and that we shall be glad to do if called upon. With our present organization it is practicable to make special inquiries through our consuls in almost any part of the world, and we are daily forwarding to the consular service interrogatories suggested by American business men. Excellent results have followed these efforts, especially where schedules of specific questions have been carefully formulated by intelligent representatives of the various trades or by the officers of trade organizations. I desire especially to get into touch with manufacturers in the Hardware industry, as we are constantly in receipt of information that would be of more or less value to them and which I should take pleasure in placing at their disposal. I wish particularly to be kept informed regarding the national organizations in the various trades, as through them we can most efficiently obtain and distribute matter of value to the industries.

Suggestions as to Exploiting American Hardware.

American Hardware is a strong line for exploitation abroad because of its superiority and cheapness. Wonderful progress has been made in the past decade in the manufacture of these specialties, much of which is due to the splendid organization of producing plants, the use of automatic tools, the specialization of skilled labor, &c. In my opinion our Hardware needs only to be shown abroad to be appreciated, and I think there is much that could be done, either by individual exporters or by the trade associations, to bring these goods before foreign dealers and consumers. Such organizations abroad as the American Chamber of Commerce in Paris and its prototype in Berlin can be relied upon for co-operation, and arrangements might easily be made through these associations for temporary or permanent displays of complete lines of our products. Foreign manufacturers have found it well worth their while to provide exhibits at the trade fairs held periodically in nearly all the large and small European towns, and a little systematic work in this direction would bring our specialties to the attention of a larger number of dealers and consumers. Catalogues should be prepared for such exhibits in French or German or the language of the country, and could be carefully illustrated to great advantage. The American consular service stands ready to co-operate in any such work, and this bureau will cheerfully lend its aid and advice at all times.

Preliminary study of the needs of the people of the countries in which it is desired to develop an export business is necessary to avoid costly mistakes. It would be folly, for example, to send Sash Weights to France, where they are unknown, because French windows open vertically on hinges and do not slide up and down. Our Builders' Hardware would be apt to prove an especially popular line in nearly all countries, because of its artistic design, superior finish and comparative cheapness.

The Bureau of Standards.

I might add a word regarding the service which the entire Department of Commerce and Labor stands ready to perform for American business men at all times. Nearly every one of its bureaus is in position to furnish information

of value if our business men will only take the trouble to ascertain what can be had upon application. The Bureau of Statistics is a mine of valuable trade information and responds cheerfully to all inquiries. The recently organized Bureau of Standards is now doing a great work for American manufacturers in the standardizing of scientific instruments, measuring apparatus of all kinds, electric appliances, &c., and its stamp of approval upon American wares is accepted throughout the world as the hallmark of excellence. All these facilities may be enjoyed by any American producer who will take the trouble to apply for them.

FOURTH OF JULY AT PORT ALLEGANY.

IN connection with the Fourth of July celebration at Port Allegany, Pa., Bard & Cheney, Hardware and Stove merchants of that place, issue what they state will be the only printed programme of the day's official doings. In it attention is called to their business, and some of the lines handled by them in the following vein, the extract given covering the morning portion of the programme:

SUNRISE.

Salute of Thirteen Guns.

Make Bard & Cheney's store your headquarters whenever in town. They have both phones and you are welcome to use them, or have them transfer messages for you.

8.30 TO 9.30 A.M.

Serenades by Various Bands.

Bard & Cheney's store will be closed at 2 p.m. for balance of the day, as the boys want a little fun themselves; so do your trading early, please.

9.30 A.M.

Ball Game.

Emporium vs. Port Allegany. Band at the Game.

The Majestic Rotary Washing Machine, sold by Bard & Cheney in Port Allegany, is one of the greatest labor savers manufactured. Does perfect work. Sold on trial. Money back if not satisfactory.

11.00 A.M.

Address by President.

and Orator of the Day in Public Square.

While this is Bard & Cheney's first year in the Implement business, they are much pleased with the sales. They find the people generally are glad to get goods made on side of the Harvester Trust, at the same time getting better goods and better terms.

11.30 A.M.

Parade.

Firemen's, Civic and Industrial. If you keep bees get Hives and supplies from Bard & Cheney. All the most used goods carried in stock and others quickly procured, at right prices.

With the programme are sent, under date June 30, two circulars, in which a cordial invitation is given to people in the vicinity "to come to the Port on the Fourth and have a good time," attention being also directed to a number of seasonable lines, including Harvesters, Potato Machinery, Separators, Pest Exterminators, Haying Tools, Bee supplies, &c.

On July 1 the Webb-Adams Hardware Company succeeded the Webb Hardware Company, Brookneal, Va., R. E. Adams becoming a member of the concern. The capital will be increased by \$10,000, a jobbing department will be added and the scope of the business will be materially enlarged.

F. N. Eckley has purchased an interest in the business of J. M. Early, San Mateo, Cal. The name of the firm is now Early-Eckley Company, Inc., which will handle Shelf Hardware, Tin and Enameled Ware.

Ivie, Payne & Thornton have engaged in business at Willamina, Ore., and will handle Shelf and Heavy Hardware, Stoves, Tinware, Agricultural Implements, Paints, Oils, Sporting Goods, Wagons and Buggies.

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The Carborundum Company's Display Cases.

THE CARBORUNDUM COMPANY, Niagara Falls, N. Y., is using effective methods to interest and encourage the trade in pushing its sharpening stones. Special efforts are made to make the line a convenient one



Fig. 1.—Triangular Display Case of Carborundum Sharpening Stones.

to handle, as well as to command the attention of the public and promote sales. The handsome and substantial display case shown in Fig. 1 is offered gratis to merchants purchasing a reasonable assortment. The case is 40 in. high and 24 in. wide in its greatest width. It is triangular in shape, giving two display surfaces which are seen from different directions, while it has a swing door in the back admitting to capacious stock shelves inside. The case is made of clear quartered oak, golden



Fig. 2.—Display Box Furnished with 1 Dozen Carborundum Niagara Scythe Stones.

finish, with plate glass fronts. The company is also offering its carborundum Niagara Scythe Stones in 1 doz. and 3 doz. With 1 doz. stones a display box (Fig. 2) is furnished made of cardboard reinforced with wood and covered with buff glazed coated paper. The boxes are hinged at the center and folded back for display, as illustrated. Two sizes are provided, one holding 10 in. and the other 12 in. stones. With 3 doz. Scythe Stones the company furnishes a substantial display box of highly polished wood.

In addition to furnishing merchants with display cases and supplying them liberally with advertising matter, the company has been conducting a window display campaign. It has representatives traveling with complete display outfits who visit different cities and install attractive windows showing the company's product. They then call upon carpenters and mechanics, demonstrating the goods and inviting them to call at the Hardware

store for souvenirs. On Saturday nights he often arranges for a public demonstration in the store.

Price-Lists, Circulars, Etc.

Manufacturers in Hardware and related lines are requested to send us copies of catalogues, price-lists, &c., for our Catalogue Department in New York; and at the same time to call attention to any new goods or additions to their lines, of which appropriate mention will be made, besides the brief reference to the catalogue or price-list in this column.

BUTLER BROS., Chicago: "Our Drummer" catalogue for the summer of 1908, referring to an extensive line of goods, many of which are seasonable for the Hardware trade. Special offers are made on 5 and 10 cent goods, Tin and Enameled Ware, &c.

FROM YAEGER-BETHEL HARDWARE COMPANY, wholesale and retail Hardware, Sporting Goods, Mill Supplies, Building Material, Stoves, Paints and Oils, Agricultural Implements, Plumbing, Roofing, &c., has reorganized its office system and now has excellent facilities for accommodating catalogues and other trade literature issued by manufacturers. The company will value catalogues, price-lists, &c., relating to hardware and allied lines.

HARDSOG MFG. COMPANY, Ottumwa, Iowa: Illustrated catalogue and price-list for 1908-1909 referring to Coal Drills and Parts and Coal Miners' Tools and Supplies.

LEADER FENCE COMPANY, St. Charles, Ill.: Illustrated catalogue referring to Leader Double Strand Reverse Twist Corrugated Farm and Lawn Fence and Fence Sundries.

PREMIER SPECIALTY COMPANY, Chicago: Illustrated Catalogue A referring to an elaborate line of Mirrors and Bathroom Furnishings.

PHILADELPHIA LAWN MOWER COMPANY, Philadelphia, Pa.: Large catalogue and price-list elaborately illustrated in colors, referring to Philadelphia Lawn Mowers.

CARVER TOOL WORKS, Spring Valley, N. Y.: Illustrated catalogue and price-list of tools of various kinds, including Cold Chisels, Brick, Marble and Metal Drills, Case, Cotton Bale and Hay Hooks, Calking Irons, Oyster and Clam Knives, Punches, Box Scrapers and Chisels, Brick and Slate Roofers' Hammers, &c.

Requests for Catalogues, Etc.

The trade is given an opportunity in this column to request from manufacturers price-lists, catalogues, quotations, &c., relating to general lines of goods.

REQUESTS for catalogues, price-lists, quotations, &c., have been received from the following houses, with whom manufacturers may desire to communicate:

FROM LEON J. LAMBERT COMPANY, 70 Calle David, Manila, P. I., which is starting business, handling Stoves, Kitchen Furniture, Plumbing and Sanitary Fixtures, Oils, Varnishes, Hose, Packing, Lubricating Oils, Engineer Supplies, &c. The company desires catalogues and export discounts. Milton E. Springer, who for the last five years has successfully managed the American Hardware & Plumbing Company, is associated with the new company.

FROM JAS. A. DEZELL, who has engaged in business in Greensboro, Fla., and will handle Shelf and Heavy Hardware, Stoves, Tinware, Paints and Oils.

FROM A. C. SNYDER, York, Neb., who is about to embark in the Shelf Hardware, Stove, Tinware, and Furnace business.

FROM G. PITARD'S SONS, New Orleans, La., dealers in Shelf and Heavy Hardware, Stoves, Tinware, Implements, Paints and Sporting Goods, who recently had a fire in their Paint department, causing about \$2000 damage.

FROM J. P. WOOD, Butte, Neb., who has bought the Hardware business of N. Seiler.

The A. B. Stropper.

The three illustrations shown herewith relate to a stropping holder for double edged safety razor blades,

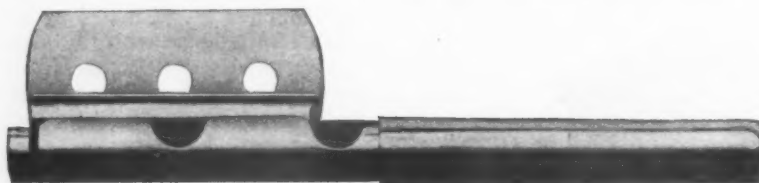


Fig. 1.—The A. B. Stropper.

put on the market by the A. B. Mfg. Company, Worcester, Mass. Fig. 1 represents the blade in the holder, ready for stropping. The blade is guided into the holder as shown in Fig. 2, until the left hand edge is even with the

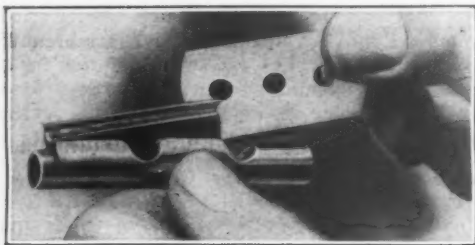


Fig. 2.—Guiding Blade Into Holder.

left hand edge of the holder jaws. The blade is pushed down into the holder as far as it will go. Then with the index finger the holder is pushed down, as in Fig. 3, where it is held in place by the handle. It is pointed out that the stropper permits of the same motion as is used

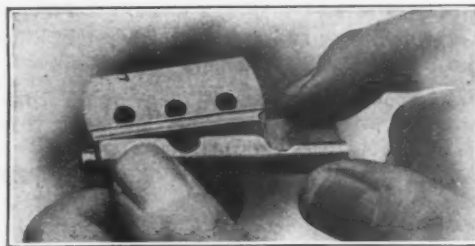


Fig. 3.—Pressing Holder Down.

when stropping an old-fashioned razor, that is, stropping one edge the length of the strop, reversing and stropping the other side of the same edge back, thus securing equal bevels on both sides of the blade.

Allsteel Lockers.

The accompanying cuts represent lockers manufactured by the General Fireproofing Company, Youngstown,



Allsteel Lockers.

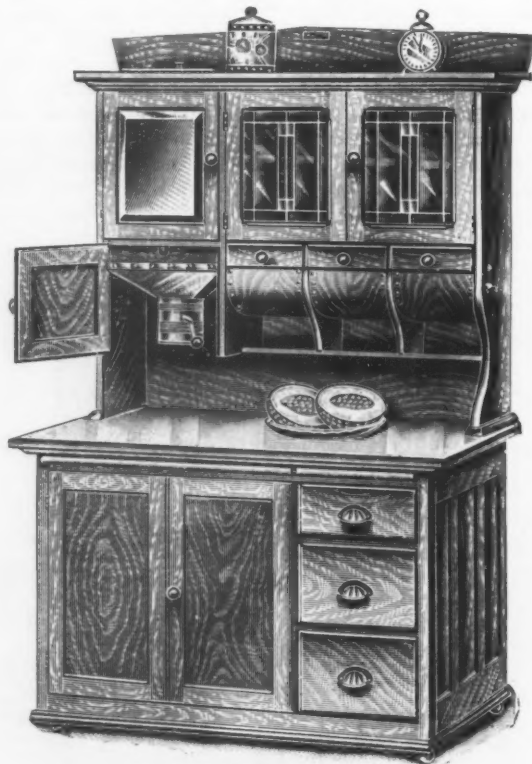
Ohio. They are built entirely of sheet steel ventilated or expanded metal. The finish is enamel, which is baked

on the steel at very high temperature, so that it cannot flake off and is not easily marred in every day use. The lockers are adaptable to use wherever lockers are required—in offices, banks, schools, hospitals, gymnasiums,

country clubs, boat clubs, mills, factories, police and fire stations, &c.

IXL Kitchen Cabinet No. 500.

An attractive and convenient kitchen cabinet, marketed by the I-X-L Furniture Company, Goshen, Ind., is here illustrated. It provides for the compact disposal of provisions and utensils where they are ready at hand when wanted for culinary purposes. In the top of the cabinet are three tilting bins for sugar and a large sanitary flour bin with sifter attached; the door to the latter compartment is fitted with a 10 x 12 in. beveled mirror. The cupboard has 10 x 12 in. leaded art glass doors, carrying card rack and want list on the inside. All the doors, drawers and tilting bins are furnished with a

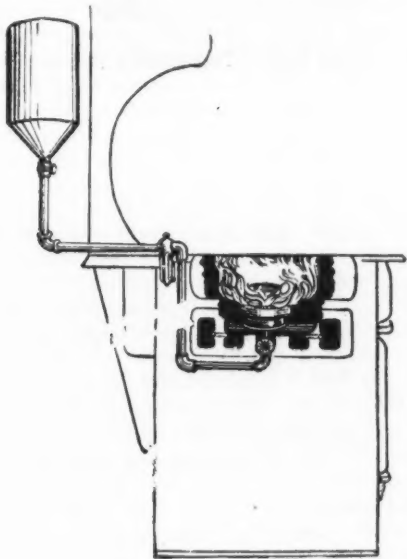


I X L Kitchen Cabinet No. 500.

sanitary lip and are trimmed with antique hardware copper. The base is constructed with a finished double top attached with screws, and has large kneading and cutting boards, which slide back underneath the top. Besides two drawers for miscellaneous use, one is provided with a removable tin bread and cake box, and the lower cupboard is supplied with a sliding shelf. On the inside of the doors are pan racks and a rack containing six spice cans. The cabinet is made of either walnut or oak in golden waxed or weathered finish and is mounted on casters. It is also built with additional drop leaves if desired. The dimensions are as follows: Top, height 44½ in., width 45 in., depth 12 in.; base, height 31 in., width 45 in., depth 29 in.; total weight 190 lb. Several other styles of this cabinet are made by the company, which states that the demand is chiefly for the better grades.

Robbinsdale Gas Generator.

The Robbinsdale Gas Generator Company, 344 Security Bank Building, Minneapolis, Minn., is offering the gas generator for use in cook stoves, ranges and heaters, as shown herewith. Cheap kerosene oil is used in the tank. It is explained that the device does not burn oil but gas which is made from the oil, burning gas and air, without offensive odors. It is stated that a baking heat



Robbinsdale Gas Generator.

has been maintained in an oven for five hours with a consumption of 1 gal. of cheap kerosene oil, but that the same quantity will last much longer, as a stove or range is ordinarily used in household service. The fire is controlled by a needle valve, so that a low or medium or very hot fire can be obtained, as desired. The illustration represents the firebox end of a stove or range, the curved line indicating an outline of a portion of the high shelf or warming closet, with the burner in operation in the firebox, and connected to the oil tank. The device can be used equally well with or without water fronts or backs.

The Knead-Full Bread and Cake Mixer.

The prominent features of the bread and cake mixer shown in the accompanying illustration, are the steel arms which hold and guide the kneading rod and crank;



The Knead-Full Bread Maker.

the tool steel hub, through which the kneading rod and crank pass, and the gripping cam. It is stated that the mixer, when assembled for work, will easily support a weight of 200 lb. upon its arms. The bottom of the pail

is made to resist the torsional strain by having an extended rim below the bottom through which a steel rod is passed and riveted to opposite sides. The rod not only stiffens the pail but affords a reliable, sanitary grip for the table clamp. The pail is made of XXXX charcoal plate, mellen grade, and all steel parts are retinned. It is offered by the Gem Mfg. Company, Boston, Everett Station, Mass.

The Buffalo Staple Puller.

The staple puller here illustrated represents a recent addition to the line of products of the Osmundson Spade Mfg. Company, Perry, Iowa. The puller is said to be the only fence tool of its kind, having a detachable jaw, a feature of improvement that is particularly emphasized. The object of this construction is to prolong the usefulness of the tool by replacement of broken jaws which may be easily and conveniently done at a trifling cost.



The Buffalo Staple Puller.

Owing to the fact that the entire strain of pulling staples is borne by the sharp points of the jaws, they are extremely liable to wear and breakage, while in other respects the tool may be as good as new and the detachable jaws make it unnecessary to discard tools otherwise unimpaired. The puller is made of stamped steel, brightly finished, and comprises a combination consisting of two staple pullers, two wire cutters, a double faced hammer and a wire stretcher, the total weight being 1 1/4 lb.

The Universal Breast Drill.

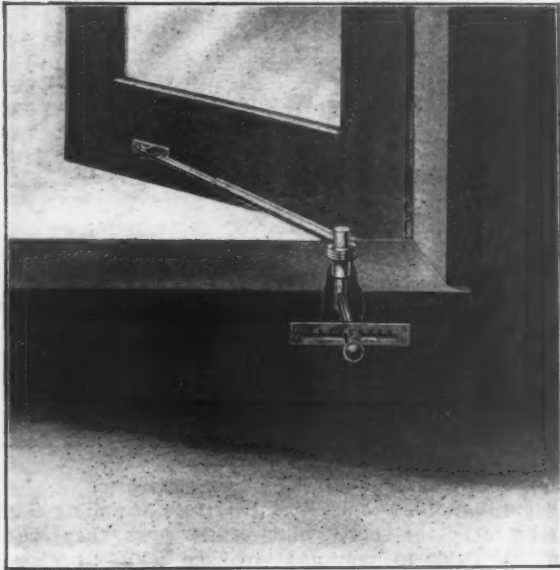
The breast drill shown herewith is placed on the market by the Lancaster Machine & Knife Works, Lancaster, N. Y. The tool is fitted up with a varied adaptation for all classes of small drilling. It has a chain feed attachment, furnished with each tool, which is operated by the supporting handle, allowing pipes, beams and similar articles to be drilled with ease. It can be adjusted to any angle making it desirable for working between girders and ceiling joists, in the interior of machinery where space is limited, and for all such work has a screw feed. When limited space does not permit a full turn of the handle the ratchet can be used. It has two speeds which can readily be changed, and the sweep of the handle is also adjustable. The gears are machine cut. The head and socket are ball bearing, and the handles are of cocobolo. The chuck is fitted with forged steel alligator jaws, which firmly hold both round and square shank drills, or the drill will be fitted with a three-jawed chuck.



The Universal Breast Drill.

Locking Casement Adjuster No. 33.

The locking casement adjuster shown herewith, and manufactured by Russell & Erwin Mfg. Company, New Britain, Conn., is made of cast bronze and is used only on casements opening out. It is especially adapted to casements fitted with inside screens or inside storm sash. Operated from the inside, as shown in the illustration,

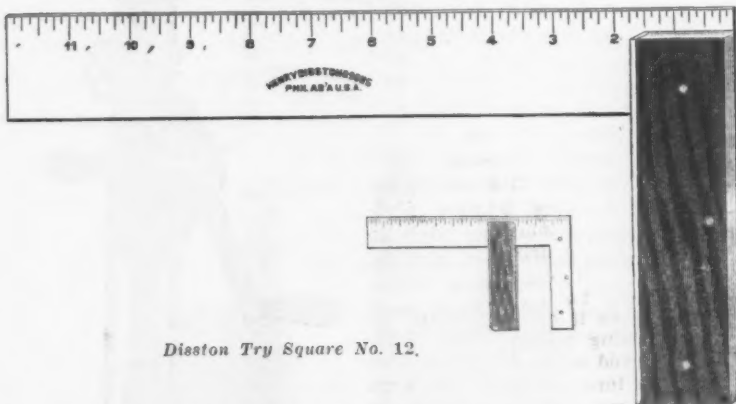


Locking Casement Adjuster No. 33.

the casement may be opened or closed by moving the bolt and without opening either screen or storm sash. The casement is firmly locked open at any angle up to 90 degrees and is always locked when closed. The adjuster is simple in construction, strong and durable. It has a locking lever and plate in the apron below the stool and a telescope arm. The device is made regularly for windows with apron not more than $4\frac{1}{2}$ in. from the inside line of sash, but it can be made to order for stools of greater width.

Disston Try Square No. 12.

The try square here shown is an addition to the line of Henry Disston & Sons, Philadelphia, Pa. It has a rose-



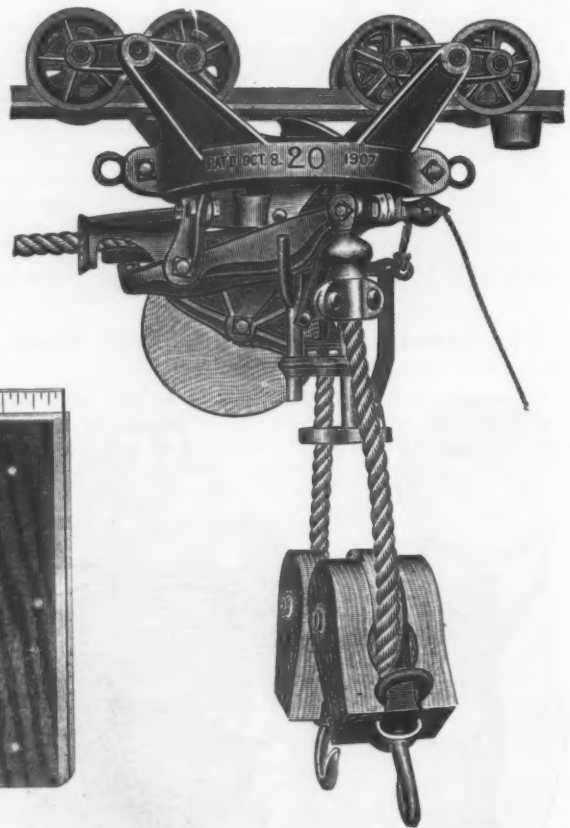
Disston Try Square No. 12.

wood stock polished, with flush heavy brass face plate fastened by a method which is said to insure security. As no screws are used and there is no countersinking the surface is finished perfectly smooth and true. The blade consists of a solid piece of L-shaped steel with one arm extending through the slotted stock flush with the back and fastened therein with heavy brass rivets. Thus the stock is practically a part of the blade affording rigidity and preventing getting out of true. The graduations are to $\frac{1}{16}$ in., and the edges are trued inside and out. The square is made only in 4, 6, 8, 10 and 12 in. sizes.

The Pease Hardware Company, Lee, Mass., suffered a loss of about \$5000 by fire, on the 19th inst.

The Diamond Swivel and Reversible Steel Track Sling Hay Carrier.

Whitman & Barnes Mfg. Company, Chicago, is putting on the market the hay carrier shown herewith, which has been in course of construction during the past year. It is built of high grade material throughout, and is simple in construction and easy to operate. All parts are referred to as of great strength and as capable of carrying very heavy loads. There are eight track wheels of large diameter, fitted with steel bearings, to make light draft and to give a long spread on the track to distribute the weight of the load. The carrier operates automatically and is tripped out of the stop by the sling pulleys engaging the underside trip, or it may be tripped by pulling a cord running over the small pulley and attached to the trip lever, which will release the carrier with the load at any distance above the floor. The carrier is built so that the load is raised at a right angle to the track, the company's regular sure grip pulleys being used. The load is deposited in the mow in the same position in which it is taken from the wagon. The load is raised with the sling carrier by the rope running over one wood sheave $7\frac{1}{2}$ in. in diameter, the sheave being of mard maple, thoroughly seasoned and fitted with rawhide bushing. When rigged for double hoist the end of the rope is held firmly in a swivel clamp, placed on the end of the gripping lever, and this prevents kinking or twisting of the rope. It is pointed out that the locking and tripping device contains few parts and is, therefore, simple, easy working and positive in action. The instant the carrier begins to leave the stop the rope grip is thrown into action and the rope is gripped and held without any slipping by the rope gripping lever from which the load is suspended. It is explained that the heavier the load the more firmly the

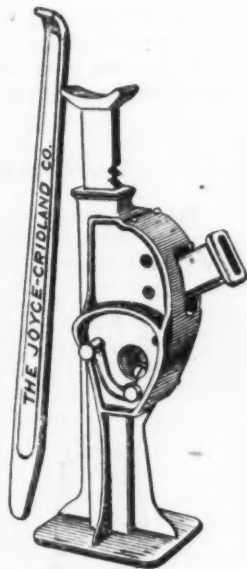


The Diamond Swivel and Reversible Steel Track Sling Hay Carrier No. 20.

rope is gripped, and as there is no slipping the rope does not wear out from this cause. The carrier can be rigged for triple hoist, as well as for double hoist, as with each carrier there is furnished an additional pulley to replace the swivel clamp used when rigged double hoist, and the rope passes through this pulley to the eye in the sure grip. The carrier is adapted for use with either center tip or end brake slings or with two double harpoon forks, one attached to each pulley. It is also built to work on 4 x 4 in. wooden track.

Twentieth Century Automobile Jack.

The Joyce-Cridland Company, Dayton, Ohio, Eastern sales office, 136 Liberty street, New York, W. M. Briggs, manager, has just put on the market the Twentieth Century automobile jack here illustrated. The dimensions are: Least height, 11½ in.; rise of bar, 6½ in.; weight, 10 lb., and lifting capacity, 1 ton. The bar and pins are of machinery steel, with every bearing surface hardened. The frame, pawl and lever are made of high grade malleable iron, with just the right proportions to insure safe work, it is said. The operating lever is shaped like an I-beam to obtain the most strength from the least weight, and its outer end is formed like a tire tool, so that it may be used in removing automobile tires. This offset likewise enables the user to work the jack in difficult situations, not only centerwise, but on either side of the center by employing the end most serviceable. There is a conveniently located, reversing lever on the side by means of which to change the jack from a rising to lowering adjustment. The lever, it is said, is always locked positively in one position or the other by bolt, and it cannot be moved unintentionally, thereby protecting an individual at work beneath a car from the danger of accidental dropping. Other advantages, referred to, are that there are but few parts, all of which are machined, that there is no cast iron in its construction and no delicate springs or screws to work loose.



Twentieth Century Automobile Jack.

Artistic Novelties.

The National Sheet Metal Company, Peru, Ill., is manufacturing a line of articles of household utility, two of which are shown herewith. Fig. 1 illustrates statue mirror No. 503, which is cast from special metal, oxidized copper finish. The mirror is made with celluloid back bearing handsome colored subjects, such as souvenir views, etc. The handle is an artistically modeled figure



Fig. 1.—Statue Mirror, No. 503 Fig. 2.—Cupid Clock No. 51.

which holds the mirror upright. The bottom of the handle is covered with cloth, preventing the scratching of furniture. Fig. 2 represents a cupid clock, which is 9 in. high, 6¼ in. wide and has a 3 in. dial. It is cast of special metal and finished in oxidized copper or antique silver. The stand is described as artistic in design and is furnished with a high grade clock, with or without alarm.

Concrete Barrow.

The Puffer-Hubbard Mfg. Company, Minneapolis, Minn., is manufacturing the wheelbarrow here shown, which is intended for use in handling concrete, cement and like material. Among the features of its construction to which attention is called is the one-piece frame and wheel yoke, the handles having at their wheel end a steel yoke or nose piece bolted underneath, which serves the purpose of holding the wheel by means of eyes

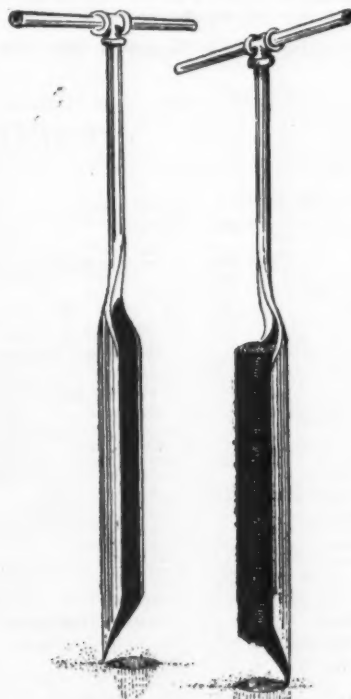


Concrete Barrow.

through which the axle bolt passes, and further serves as a dumping nose. It also holds the handles in place and gives great rigidity and strength, which are also added to by the one-piece tray brace in front, which is fastened to either handle and to the tray. The wheel is made of malleable iron and legs and braces of channel steel, with all parts riveted, doing away with bolts and nuts and making easy the process of setting up. The tray is of No. 15 gauge steel and has a capacity of 4 cu. ft. It is new in design, having an extra heavy rod at the top, and is so shaped that the contents is carried well forward, giving correct balance. The handles are of selected rock elm and are said to be longer than ordinarily used.

The One Minute Post Hole Digger.

The accompanying illustrations show a post hole digger offered by the Osmundson Spade Mfg. Company, Perry, Iowa. The tool consists of a pointed semi-circular disk with cutting edges, and is not, it is remarked, in any sense a post auger. It is designed to cut a circular hole and to remove the dirt in a solid core, as



The One Minute Post Hole Digger.

shown in the lower illustration. The tool is made of sheet steel, ¼ in. thick, with an extension of pipe into which the handle is fitted, the total length of the tool being 3½ ft. The company claims that with the digger a post hole can be dug in one minute, which accounts for its name.

Neoga Hydraulic Washer.

A washing machine of simple construction and method of operation, manufactured by A. P. Leming, Urbana, Ill., is shown in the three accompanying cuts. The agitation of the clothes is accomplished by rocking the washer to

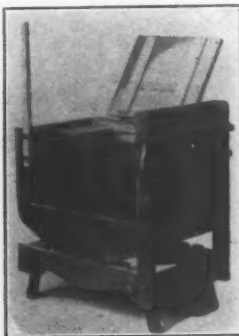


Fig. 1.—The Neoga Hydraulic Washing Machine.

Fig. 2.—Washing Machine Wringer Stand Locked and Lid Thrown Open.

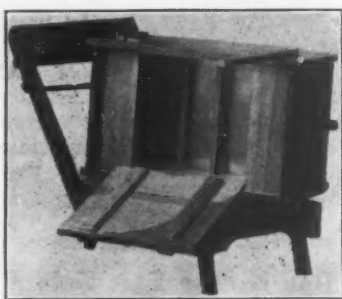


Fig. 3.—Partial View of Interior of Washing Machine Suds Box.

and fro on its bed (Fig. 1), the object being to cleanse by forcing water through the clothes. Rubbing of the garments washed in this machine is, therefore, entirely eliminated. In order to get the full effects of the flow of water from one end to the other when the machine is in motion, it is recommended that a momentary pause at

each end of the stroke is desirable and the regular ebb and flow of water thus produced will assist in maintaining the rocking motion. The machine is held in stationary position by raising the wringer stand, which locks to the machine as shown in Fig. 2. This prevents oscillation of the tub when putting in or taking out clothes. In Fig. 3 a partial view of the suds box is shown. The washer is made with zinc lining throughout. Seven gallons of water are said to be all that is required at one time, that amount being sufficient to cover the clothes.

Won't Slip Removable Calks.

The James Reynolds Mfg. Company, New Haven, Conn., is putting on the market the removable horseshoe calks here illustrated. Fig. 1 shows the No. 1 sharp calk to be used when streets are covered with ice and snow, and Fig. 2 the blunt calk made of the same material as No. 1, to be used in the absence of snow and ice. The calks have a high carbon steel center, which becomes

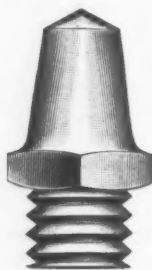


Fig. 1.—Sharp Calk.

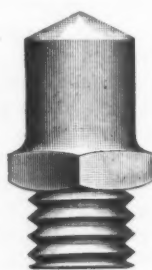


Fig. 2.—Blunt Calk.

Won't Slip Removable Calks.

very hard while the outside remains soft because made of best refined iron. As the iron is comparatively soft it wears from around the steel, leaving the steel center exposed, which will grip into the footing and prevent slipping. The center is welded in, and runs the entire length of the calk, so that it cannot come out. The calks have standard threads, which will fit any standard calk tap. Six sizes are listed from 5-16 to 5/8.

PAINTS, OILS AND COLORS

Animal, Fish and Vegetable Oils—

Animal, Fish and Vegetable Oils—	per gal.
Linseed, State and Western, raw	42 @ 44
City, Boiled	45 @ 46
City, Raw	44 @ 45
Raw, Calcutta, in bbls.	70 @ 71
Lard, Prime, Winter	56 @ 57
Extra No. 1	54 @ 55
No. 1	47 @ 48
Cotton-seed, Crude, f.o.b. mill	40 @ 41
Summer Yellow, prime	48 @ 49 1/2
Summer White	48 @ 49
Yellow Winter	49 @ 50
Tallow, Acidless	52 @ 53
Menhaden, Brown, Strained	38 @ 39
Southern	28 @ 29
Light Strained	38 @ 39
Bleached Winter	40 @ 41
Ex. Bleached Winter	42 @ 43
Cocanut, Ceylon	7 @ 7 1/2
Cochin	7 @ 7 1/2
Cod, Domestic, Prime	42 @ 44
Newfoundland	43 @ 45
Red, Elaine	37 @ 39
Sapindus	5 @ 5 1/2
Olive, Yellow	66 @ 67
Neatsfoot, Prime	55 @ 58
Palm, Lagos	5 @ 5 1/2

Mineral Oils—

Mineral Oils—	per gal.
Black, 29 gravity, 25 @ 30 cold test	13 @ 13 1/2
29 gravity, 15 cold test	13 1/2 @ 14
Summer	12 1/2 @ 13
Cylinder, light filtered	20 1/2 @ 21
Dark, filtered	18 @ 19
Paraffine, 903-907 sp. gravity	14 1/2 @ 15
903 sp. gravity	13 1/2 @ 14
903 sp. gravity	11 @ 11 1/2
Red	13 1/2 @ 14

Miscellaneous—

Miscellaneous—	per ton
Barites:	
White, Foreign	\$18.50 @ \$20.50
Amer., floated	\$18.00 @ \$20.00
Off color	\$13.00 @ \$16.50
Chalk, in bulk	\$3.00 @ \$3.40
China Clay, Imported	\$11.50 @ \$13.00

Animal, Fish and Vegetable Oils—	per gal.
Cobalt, Oxide	\$1.45 @ \$2.60
Whiting, Commercial	\$1.42 @ \$2.52
Gilders	\$1.55 @ \$2.07
Ex. Gilders	\$1.60 @ \$2.05

Putty, Commercial—

Putty, Commercial—	per 100 lb.
In bladders	\$1.70 @ \$1.80
In bbls. or tubs	1.20 @ 1.45
In 1 lb to 5 lb cans	2.65 @ 2.95
In 12 1/2 to 50 lb cans	1.50 @ 1.90

Spirits Turpentine—

Spirits Turpentine—	per gal.
In Oil bbls.	42 @ 42 1/2
In machine bbls.	42 1/2 @ 43

Glue—

Glue—	per lb.
Cabinet	12 @ 15
Common Bone	7 1/2 @ 9
Extra White	16 @ 21
Fish, liquid, 50 gal. bbls., per gal.	60 @ 120
Foot Stock, White	12 @ 14
Foot Stock, Brown	9 @ 11
German Common Hide	10 @ 12
German Hide	12 @ 18
French	10 @ 20
Irish	13 @ 16
Low Grade	10 @ 12
Medium White	14 @ 17

Gum Shellac—

Gum Shellac—	per lb.
Bleached, Commercial	28 @ 29
Bone Dry	35 @ 36
Button	30 @ 40
Diamond I.	47 @ 48
Fine, Orange	24 @ 35
A. C. Garnet	28 @ 29
G. A. L.	18 @ 19
Kala Button	20 @ 21
D. C.	48 @ 49
Octagon B.	39 @ 40
T. N.	29 @ 32
V. S. O.	47 @ 48

Colors in Oil—

Colors in Oil—	per lb.
Black, Lampblack	12 @ 14
Rhine, Chinese	26 @ 26
Blue, Prussian	32 @ 36
Blue, Ultramarine	13 @ 16

Animal, Fish and Vegetable Oils—	per lb.
Brown, Vandyke	11 @ 14
Green, Chrome	12 @ 16
Green, Paris	12 @ 24
Sienna, Raw	12 @ 15
Sienna, Burnt	12 @ 15
Umber, Raw	11 @ 14
Umber, Burnt	11 @ 14

White Lead, Zinc, &c.—

White Lead, Zinc, &c.—	per lb.
Lead, English white, in Oil, 10% @ 10%	
Lead, American White:	
Dry and in Oil, 100, 250 and 500 lb kegs	7
Dry and in Oil, 25 and 50 lb kegs	7 1/2
Dry and in Oil, 12 1/2 lb kegs	7 1/2
In Oil, 25 lb tin pails	8
In Oil, 12 1/2 lb tin pails	8
In Oil, 1, 2, 3 and 5 lb tin cans, ass't.	9
In lots of less than 500 lbs.	1 1/2 @ 1 1/2 advance over above prices.
Lead, American. Terms: On lots of 500 lb and over, 60 days, or 2% for cash if paid in 15 days from date of invoice.	

Zinc, Dry—

Zinc, Dry—	per lb.
American, dry	5 1/2 @ 5 1/2
Red Seal (French process)	6 1/2 @ 7
Green Seal	7 1/2 @ 7 1/2
German Red Seal (French process)	6 1/2 @ 6 1/2
Green Seal	7 1/2 @ 7 1/2
White Seal	7 1/2 @ 8 1/2
French, Red Seal	8 1/2 @ 8 1/2
Green Seal	10 1/2 @ 10 1/2

Dry Colors—

Dry Colors—	per lb.
Black, Carbon	6 1/2 @ 10
Black Drop, American	3 1/2 @ 6
Black Drop, English	5 @ 15
Black, Ivory	16 @ 20
Lamp, commercial	4 @ 6
Blue, Celestial	4 @ 6
Blue, Chinese	31 @ 33
Blue, Prussian	23 @ 31
Blue, Ultramarine	3 1/2 @ 15

Animal, Fish and Vegetable Oils—	per lb.
Brown, Spanish	1 1/2 @ 1
Carmin, No. 40	\$3.10 @ \$3.25
Green, Chrome, ordinary	3 1/2 @ 5
Green, Chrome, pure	17 @ 25
Red Lead and Litharge:	
In 100 lb kegs	7
In 25 and 50 lb kegs	7 1/2
In 12 1/2 lb kegs	7 1/2
In lots of less than 500 lbs.	1 1/2 @ 1 1/2 advance over above prices.
In bbls. and 1/2 bbls., same price as in kegs.	
Terms: Same as for White Lead.	
Ocher, American	\$1.50 @ \$1.60
American Golden	2 1/2 @ 3 1/2
French	1 1/2 @ 2
Foreign Golden	3 @ 4
Orange Mineral, English	10 @ 12
French	12 @ 13
German	12 @ 13
American	9 @ 10
Red, Indian, English	1 1/2 @ 6
American	3 @ 3 1/2
Red, Turkey, English	4 @ 10
Red, Tuscan, English	7 @ 10
Red, Venetian, Amer.	\$1.00 @ \$1.25
English	\$1.00 @ \$1.15
Sienna, Italian, Burnt and Powdered	3 @ 9
Italian, Raw, Powdered	3 @ 7
American, Raw	1 1/2 @ 2
American Burnt and Pow'd.	1 1/2 @ 2
Talc, French	\$1.00 @ \$1.25
American	\$1.00 @ \$1.25
Terra Alba, French	\$1.00 @ \$1.25
English	\$1.00 @ \$1.25
American	\$1.00 @ \$1.25
Umber, T'key, Bnt. & Pow'd.	2 1/2 @ 3
Turkey, Raw and Powdered	2 1/2 @ 3
Burnt, American	1 1/2 @ 2
Raw, American	1 1/2 @ 2
Yellow, Chrome, Pure	13 1/2 @ 15
Vermilion, American Lead	7 @ 25
Quicksilver, bulk	66 @ 66
Quicksilver, bags	66 @ 66
English, Imported	65 @ 70
Chinese	\$0.90 @ \$1.00

Current Hardware Prices.

General Goods.—In the following quotations General Goods—that is, those which are made by more than one manufacturer—are printed in *Italics*, and the prices named, unless otherwise stated, represent those current in the market as obtainable by the fair retail Hardware trade, whether from manufacturers or jobbers. Very small orders and broken packages often command higher prices, while lower prices are frequently given to larger buyers.

Special Goods.—Quotations printed in the ordinary type (Roman) relate to goods of particular manufacturers, who are responsible for their correctness. They usually represent the prices to the small trade, lower prices being obtainable by the fair retail trade, from manufacturers or jobbers.

Range of Prices.—A range of prices is indicated by means of the symbol @. Thus 33½ @ 33½ & 10% signifies

that the price of the goods in question ranges from 33½ per cent. discount to 33½ and 10 per cent. discount.

Names of Manufacturers.—For the names and addresses of manufacturers see the advertising columns and also THE IRON AGE DIRECTORY, issued May, 1907, which gives a classified list of the products of our advertisers and thus serves as a DIRECTORY of the Iron, Hardware and Machinery trades.

Standard Lists.—"The Iron Age Standard Hardware Lists" contains the list prices of many leading goods.

Additions and Corrections.—The trade are requested to suggest any improvements with a view to rendering these quotations as correct and as useful as possible to Retail Hardware Merchants.

Adjusters, Blind—

Columbian and Domestic.....33½%
North's.....10%
Zimmerman's—See Fasteners, Blind.

Window Stop—

Ives' Patent.....35%
Taplin's Perfection.....35%

Ammunition—See Caps, Cartridges, Shells, &c.

Anti-Rattlers—

Fernald Mfg. Co. Burton Anti-Rattlers, per doz. pairs, Nos. 1, \$0.75; 2, \$0.60; 4, \$1.00; 5, \$0.50.
Fernald Quick Shifter, per doz. pairs.....\$2.00@3.00

Anvils—American—

Eagle Anvils.....per lb. @ 8½¢
Hay-Budden, Wrought.....9½¢@9¾¢
Trenton.....per lb. 9½¢@9¾¢

Imported—

Swedish Solid Steel Sisco, Superior, per lb.....10¢@10½¢
Peter Wright & Sons, per lb. 84 to 349 lb. 11¢; 350 to 600 lb. 11½¢.

Anvil, Vice and Drill—

Millers Falls Co., \$18.00.....15¢@10%

Apple Parers—See Parers, Apple, &c.

Aprons, Blacksmiths'—

Livingston Mfg. Co.....10%

Augers and Bits—

Com. Double Spur.....75¢@10¢@80%
Jennings' Patn., Bright.....65¢@10¢@70%
Black Lip or Blued.....65¢@65¢
Boring Mach. Augers.....70%
Car Bits, 12-in. twist.....40¢@10%
Ford's Auger and Car Bits.....40¢@5%
Ft. Washington Auger Co., Concord's.....35%
Forster Pat. Auger Bits.....25%
C. E. Jennings & Co.:
No. 10 ext. lip, R. Jennings' list.....25¢@7½¢
No. 30, R. Jennings' list.....50%
Russell Jennings' list.....25¢@10¢@2½¢
L'Hommedieu Car Bits.....15%
Mayhew's Countersink Bits.....45%
Pugh's Black.....20%
Pugh's Jennings' Pattern.....35%
Snell's Auger Bits.....60%
Snell's Bell Hangers Bits.....60%
Snell's Car Bits, 12-in. twist.....60%
Snell's King Auger Bits.....50%
Wright's Jennings Bits.....50%

Bit Stock Drills—

See Drills, Twist.

Expansive Bits—

Clark's Pattern, No. 1, per doz., \$28;
No. 2, \$18.....60¢@10%
Ford's, Clark's Pattern.....66¢@5%
C. E. Jennings & Co., Steer's Pat. 25%
Lavigne Pat., small size, \$18.00; large size, \$26.00.....60¢@10%
Swan's.....60%

Gimlet Bits—

Common Dbl. Cut.....per gro. \$3.00@3.25
German Pattern, Nos. 1 to 10, \$4.75; 11 to 13, \$5.75

Hollow Augers—

Bonney Pat., per doz. \$5.50@6.00
Ames.....25¢@10%
Universal.....20%

Ship Augers and Bits—

Ship Augers.....10¢@10¢@%
Ford's.....33%
C. E. Jennings & Co.:
L'Hommedieu's.....6%
Watrous'.....33%
Snell's.....48%

Awl Hafts—See Handles, Mechanics' Tool.

Awls—

Brad Awls:
Handled.....gro. \$2.75@3.00
Unhanded, Shl'dered.....gro. \$3.00@3.66¢
Unhanded, Patent.....gro. \$0.66@70¢
Peg Awls:
Unhanded, Patent.....gro. 31¢@3½¢
Unhanded, Shl'dered.....gro. 65¢@70¢
Scratch Awls:
Handled, Com.....gro. \$3.50@4.00
Handled, Socket.....gro. \$11.50@12.00

Awl and Tool Sets—See Sets, Awl and Tool.

Axes—

Single Bit, base weights: Per doz.
First Quality.....\$4.75@5.00
Second Quality.....\$4.25@4.50
Double Bit, base weights:
First Quality.....\$7.00@7.50
Second Quality.....\$6.50@6.75

Axle Grease—

See Grease, Axle.

Axles—

See Grease, Axle.

Concord, Loose Collar.....4¼¢@4½¢
Concord, Solid Collar.....4¼¢@4½¢
No. 1 Common, Loose.....3¼¢@4¢
No. 1½ Com., New Style.....4¼¢@4½¢
No. 2 Solid Collar.....4¼¢@4½¢
Half Patent:
Nos. 7, 8, 11 and 12.....70%
Nos. 13 to 15.....70%
Nos. 15 to 18.....70¢@10¢@70¢@5%
Nos. 19 to 22.....70¢@10¢@70¢@5%

Boxes, Axles—

Common and Concord, not turned.....lb. 3¢@6¢
Common and Concord, turned, lb. 6¢@7¢
Half Patent.....lb. 9½¢@10¢

Bait—

Fishing—

Hendryx:
A Bait.....20%
B Bait.....25%
Competitor Bait.....20¢@5%
Caldwell new list.....50¢@10%
Pullman.....50¢@10%

Balances—

Sash—

Caldwell new list.....50¢@10%
Pullman.....50¢@10%

Spring—

Light Spring Balances.....60¢@60¢@5%
Chatillon's:
Light Spg. Balances.....50¢@50¢@10%
Straight Balances.....40¢@40¢@10%
Circular Balances.....50¢@10%
Large Dial.....30%
Barb Wire—See Wire, Barb.

Bars—

Crow—

Steel Crowbars, 10 to 40 lb. per lb., 2¼¢@2½¢

Towel—

No. 10 Ideal, Nickel Plate.....per gro. \$3.50

Beam, Scale—

Scale Beams.....10%
Chatillon's No. 1.....30%
Chatillon's No. 2.....40%

Beaters, Carpet—

Holt-Lyon Co.:
No. 12 Wire Coppered per doz. \$0.80;
Tinned.....\$0.85
No. 11 Wire Coppered per doz. \$1.15;
Tinned.....\$1.20
No. 10 Wire Tinned.....per doz. \$1.50

Beaters Egg—

Dover Stamping & Mfg. Co.:
Genuine Dover, per gro. No. 1, Tumbler Size, \$7.50; No. 2, Family Size, \$7.50; No. 3, Extra Family Size, \$24.00; No. 4, Hotel Size, \$30.00.

Holt-Lyon Co.: No. 5, Jap'd \$0.80; No. A, Jap'd, \$1.15; No. B, Jap'd, \$1.85; No. 6, Jap'd, \$1.65; Lyon, Jap'd, per doz., No. 2, \$1.35.

Taplin Mfg. Co.: Improved Dover, per gro. No. 60, \$6.00; No. 75, \$6.50; No. 100, \$7.00; No. 102, Tin'd, \$8.50; No. 150, Hotel, \$15.00; No. 152, Hotel Tin'd, \$17.00; No. 200, Tumbler, \$8.50; No. 202, Tumbler, Tin'd, \$9.50; No. 300, Mammoth, per doz., \$25.00.

Bellows—

Blacksmith, Standard List:
Split Leather.....60¢@10¢@65%
Grain Leather.....50¢@50¢@10%

Hand—

Inch.....6 7 8 9 10
Doz. \$5.00 5.50 6.00 6.50 7.50

Molders—

Inch.....10 12 14 16
Doz. \$7.50 9.00 12.00 15.00

Bells—

Cow—

Wrought Cow Bells.....75%
Jersey.....75¢@10%
Texas Star.....50%

Door—

Home, R. & E. Mfg. Co.'s.....55¢@10%

Hand—

Polished, Brass.....60¢@60¢@10%
White Metal.....60¢@60¢@10%
Nickel Plated.....50¢@10%
Sutras.....50¢@10%
Cone's Globe Hand Bells.....33%@35%

Miscellaneous—

Farm Bells.....lb. 2¼¢@2½¢
Church and School.....60¢@60¢@10%

Belting—

Leather—

Standard.....70¢@10¢@70¢@5%
Light.....75¢@10%
Cut Leather Lacing.....60¢@60¢@10%
Leather Lacing Sides, per sq. ft. 20¢

Rubber—

Competition (Low Grade).....70¢@10¢@75%
Standard.....60¢@10¢@70%
Best Grades.....40¢@50%

Bench Stops—

See Stops, Bench

Benders and Upsetters, Tire—

Green River Tire Benders and Upsetters.....20%

Bicycle Goods—

John S. Leung's Son & Co.'s 1907 list:
Chain, Parts, Spokes.....50%
Tubes.....60%

Bits—

Auger, Gimlet, Bit Stock Drills, &c.—See Augers and Bits.

Blocks

Tackle—

Common Wooden.....75¢@75¢@5%
B. & L. R. Co.:
Boston Wood Snatch, 50%; Eclipse Steel, 75%; Hollow Steel, 50¢@10%
Star Wire Rope, 50%; Tarbox Metal Snatch, 50%; Tarbox New Style Steel, 50¢@10%; Wire Rope Snatch, 50%
Lange's Patent Automatic Lock and Junior.....30%
See also Machines, Hoisting.

Boards, Stove—

Paper and Wood Lined.....55%
Embossed.....55%

Boards, Wash—

See Washboards.

Bobs, Plumb—

Keuffel & Esser Co.....33½%

Bolts

Carriage, Machine, &c.—

Common Carriage (cut thread):
¾ x 6 and smaller.....75¢@60¢
Larger and longer.....70¢@
Phila. Eagle, \$3.00 list.....80¢@
Bolt Ends.....70¢@

Machine (Cut Thread): ¾ x 4 and smaller.....75¢@10¢@% Larger and longer.....70¢@%

Door and Shutter—

Cast Iron Barrel, Japanned, Round Brass Knobs:
Inch.....3 4 5 6 8
Per doz. \$0.30 .35 .45 .60 .80
Cast Iron Spring Foot, Jap'd:
Inch.....6 8 10
Per doz. \$1.20 1.50 2.25
Cast Iron Chain, Flat, Japanned:
Inch.....6 8 10
Per doz. \$1.00 1.40 1.65
Cast Iron Flat Shutter, Jap'd, Brass Knobs:
Inch.....6 8 10
Per doz. \$0.75 .95 1.25
Wrought Barrel Japanned, 80¢@10¢@80¢@10¢@5%
Barrel Bronzed.....60¢@10%
Spring.....70¢@10¢@70¢@10%
Shutter.....50¢@50¢@10¢@5%
Square Neck.....75¢@75¢@10%
Square.....70¢@10¢@10¢@80%
Ives' Patent Door.....55%
Ives' Wrought Metal.....45%

Expansion—

F. H. Evans' Crescent.....40¢@60%
Richards Mfg. Co.....55¢@10%
Steward & Romain Mfg. Co.:
Style No. 13, Double.....60%
Style No. 1, Single.....60%
Style No. 109, Dbl. Jaw, Single.....55%
Lag Screw.....66%

Plow and Stove—

Plow.....65¢@5¢@70%
Stove.....85¢@85¢@5%

Tire—

Common Iron.....80¢@10¢@5%
Norway Iron.....80¢@80¢@5%
American Screw Co.:
Norway Phila., list Oct. 16, '81.....80%
Eagle Phila., list Oct. 16, '81.....82½%
Bay State, list Dec. 28, '99.....80%
Franklin Moore Co.:
Norway Phila., list Oct. 16, '81.....80%
Eagle Phila., list Oct. 16, '81.....82½%
Eclipse, list Dec. 28, '99.....80%
Russell, Burdall & Ward Bolt & Nut Co.:
Empire, list Dec. 28, '99.....80%
Norway Phila., list Oct. '81.....80%
Eagle.....82½%
Shelton Co.:
Tiger Brand, list Dec. 28, '99.....80%
Phila., Eagle, list Oct. 16, 1881, 82½%
Upon Nut Co.:
Tire Bolts.....72½%

Borers, Bung—

Borers Bung, Ring, with Handle:
Inch.....1¼ 1½ 1¾ 2
Per doz. \$3.80 5.60 6.30 8.00
Inch.....2¼ 2½
Per doz. \$8.65 11.50
Enterprise Mfg. Co., No. 1, \$1.25; No. 2, \$1.75; No. 3, \$2.50 each.....25%

Boxes, Mitre—

C. E. Jennings & Co.....25%
Langdon, New Langdon and Langdon Improved, 23¢@10%; Langdon Arms.....15¢@10%
Perfection.....40%
Seavey.....45%

Braces—

Common Ball, American.....\$1.50
Barber's.....50¢@10¢@60¢@10%
Fray's Genuine Spofford's.....60%
Fray's No. 61, 166, 206, 614.....50%
C. E. Jennings & Co.....50¢@5%
Mayhew's Ratchet.....60%
Mayhew's Quick Action Hay Pat.....50%
Millers Falls Drill Braces.....25¢@10%
P. S. & W. Co., Peck's Pat.....60¢@10%

Brackets—

Wrought Steel.....75¢@10¢@75¢@10¢@10%
Bradley Metal Clasp.....80¢@10¢@80¢@10¢@5%
Griffin's Pressed Steel.....75¢@75¢@10%
Griffin's Folding Brackets.....70¢@10%
Taplin Victor Handy Egg Beater Bracket.....per doz. \$1.50

Bright Wire Goods—

See Wire and Wire Goods.

Broilers—

Kilbourne Mfg. Co.....75¢@20%
Wire Goods Co.....75%

Buckets, Galvanized—

Mfr's list, price per gross:
Quart.....10 12 14
Water, Reg. 26.85 29.50 33.50
Water, Hvy. 47.35 48.00 52.00
Fire, Rd. Btm. 32.00 34.65 38.65
Well.....37.35 41.35 45.35

Full Rings—See Rings, Bull.

Butts—

Wrought, High List, Oct. 26, '06, 55%
Cast Brass, Tiebout's.....40%

Cast Iron—

Fast Joint, Broad.....40¢@10¢@50%
Fast Joint, Narrow.....40¢@10¢@50%
Loose Joint.....70¢@10¢@75%
Loose Pin.....70¢@10¢@75%
Mayer's Hinges.....70¢@70¢@5%
Parliament Butts.....70¢@70¢@5%

Wrought Steel—

Bright:
Light Narrow, Light Reversible.....70¢@5%
Reversible and Broad.....70¢@5%
Loose Joint, Narrow, Light Inside Blind, &c.....70%
Back Flaps, Table Chest.....65%
Japanned:
Light Narrow, Loose Pin.....40¢@5%
Light Narrow, Ball Tip.....60%
Broad.....40¢@5%
Steeple Tipped.....70%
Ball Tipped.....70%

Net Prices.

Extra, 10¢@

Cages, Bird—

Hendryx Brass: Series 3000, 5000, 1100, net list; 1200, 15%; 200, 300, 900 30%
Hendryx Bronze: Series 700, 800, 300 30%
Hendryx Enameled 35%

Calipers—See Compasses.

Calks, Toe and Heel—

Blunt, 1 prong, per lb. 40¢
Sharp, 1 prong, per lb. 45¢
Burke's, Blunt, 4¢; Sharp, 4¢
Lautier, Blunt, 4¢; Sharp, 4¢
Perkins', Blunt, 4¢; Sharp, 4¢

Can Openers—

See Openers, Can.

Caps, Percussion—

Eley's E. B. 52¢
G. D. per M 34¢
F. L. per M 40¢
G. E. per M 48¢
Musket per M 62¢

Primers—

Berdan Primers, 32 per M. 20¢
Primer Shells and Bullets. 15¢
All other primers per M. 1.50

Carpet Stretchers—

See Stretchers, Carpet.

Cartridges—

Blank Cartridges:
32 C. F., \$5.50 10¢
38 C. F., \$7.00 10¢
22 cal. Rim, \$1.50 10¢
32 cal. Rim, \$2.75 10¢
B. B. Caps, Con. Ball, Swg. \$1.90
B. B. Caps, Round Ball. \$1.19
Central Fire 25¢
Target and Sporting Rifle. 15¢
Primed Shells and Bullets. 15¢
Rim Fire, Sporting 50¢
Rim Fire, Military 15¢

Castors—

Bed 65¢
Plate 60¢
Philadelphia 70¢
Acme, Ball Bearing 35¢
Gem (Roller Bearing) 70¢
Steel Gem 50¢
Standard Ball Bearing 45¢
Yale (Double Wheel) low list. 40¢

Cattle Leaders—

See Leaders, Cattle.

Chain, Proof Coil—

American Coil, Straight Link:
3-16 1/4 5-16 3/4 7-16 1/2 1/2
\$8.15 5.55 4.60 3.95 3.75 3.65 3.55
3/4-1 1/2 to 1 1/2 inch.
\$3.45 3.55

In cask lots, deduct 25¢.

German Coil 60¢
German Pattern Coil:
6-0 to 1 70¢
2 and 3 60¢
4, 5 and 6 50¢

Halter—

Halter Chains 60¢
German Pattern Halter Chains.
list July 2, '07 60¢
Covert Mfg. Co.:
Halter 35¢

Cow Ties—

See Halters and Ties.

Traces, Wagon, &c.—

Traces, Western Standard: 100 pr.
6 1/2-6 3/4, Straight, with ring. \$28.00
6 1/2-6 3/4, Straight, with ring. \$29.00
6 1/2-6 3/4, Straight, with ring. \$32.00
6 1/2-10-2, Str'ght, with ring. \$37.00
NOTE—Add 2¢ per pair for Hooks
Twist Traces: add per pair for Nos. 2
and 3, 2¢; No. 1, 3¢; No. 0, 4¢ to price of
Straight Link.

Eastern Standard Traces, Wag-
on Chain, etc. 60¢

Miscellaneous—

Jack Chain, list July 10, '07:
Iron 60¢
Brass 65¢
Safety and Plumbers' Chain. 75¢
Gal. Pump Chain 45¢
Bridgeport Chain Co.:
Triumph Halter and Coll. 35¢
Triumph Dog 50¢
Brown Halter and Coll. 45¢
Covert Mfg. Co.:
Breast, Halter, Heel, Rein, Stal-
lion 40¢
Oneida Community:
American Halter, Dog and Kennel
Chains 35¢
Niagara Dog Leads and Kennel
Chains 45¢
Wire Goods Co.:
Dog Chain 70¢
Universal Dbl.-Jointed Chain 50¢

Chain and Ribbon, Sash—

Oneida Community:
Steel Chain 60¢
Pullman:
Bronze Chain, 60%: Steel Chain.
Coppered 80¢
Sash Chain Attachments, per set. 5¢
Aluminum Sash Ribbon, per 100
ft. \$2.00
Sash Ribbon Attachments, per set. 8¢

Chalk— (From Jobbers.)

Carpenters' Blue 50¢
Carpenters' Red 40¢
Carpenters' White 45¢

Checks, Door—

Bardsley's 45¢
Pullman, per gro. 55¢
Russwin 35¢

Chests, Tool—

American Tool Chest Co.:
Boys' Chests, with Tools 55¢
Youths' Chests, with Tools 40¢
Gentlemen's Chests, with Tools. 25¢
Farmers', Carpenters, etc., Chests,
with Tools 20¢
Machinists' and Pipe Fitters'
Chests, Empty 45¢
Tool Cabinets 45¢
C. E. Jennings & Co.'s Machinists'
Tool Chests 75¢

Chisels—

Socket Framing and Firmer
Standard List 80¢
Buck Bros. 30¢
C. E. Jennings & Co.:
Socket Framing No. 10 25¢
Socket Framing No. 15 25¢
Swan's 60¢
L. & I. J. White & Co. 30¢

Tanged—

Tanged Firmers 30¢
Buck Bros. 30¢
C. E. Jennings & Co. Nos. 191, 181, 25¢
L. & I. J. White Co. 25¢

Cold—

Cold Chisels, good quality. 15¢
Cold Chisels, fair quality. 12¢
Cold Chisels, ordinary 9¢

Chucks—

Almond Drill Chucks 35¢
Almond Turret Six-Tool Chuck. 40¢
Beach Pat, each \$8.00 35¢
Empire 25¢
Blacksmiths' 25¢
Jacobs' Drill Chucks 35¢
Pratt's Positive Drive 25¢
Skinner Patent Chucks 25¢
Independent Lathe Chucks 35¢
Universal, Reversible Jaws. 35¢
Combination, Reversible Jaws. 35¢
Drill Chucks, New Model, 25¢
Standard, 45¢; Skinner Pat.
25¢; Positive Drive 10¢
Placer Chucks 20¢
Face Plate Jaws 35¢
Standard Tool Co.:
Improved Drill Chuck 45¢
Union Mfg. Co.:
Combination, Nos. 1, 2, 3, 4, 5, 6,
7, 8 and 17, 40¢; No. 21, 35¢
Scroll Combinations, Nos. 83 and
84 30¢
Geared Scroll, Nos. 33, 34 and 35, 25¢
Independent Iron, Nos. 18 and 318, 35¢
Independent Steel, No. 64 25¢
Union Drill, Nos. 000, 00, 100, 101,
102, 103, 104 25¢
Union Car Drill 25¢
Universal, 11, 12, 16, 17, 13, 14, 15, 40¢
Universal No. 42 35¢
Iron Face Plate Jaws, Nos. 28, 30,
38 and 50 35¢
Steel Face Plate Jaws, Nos. 70 and
72 30¢
Westcott Patent Chucks 30¢
Lathe Chucks 50¢
Little Giant Auxiliary Drill 50¢
Little Giant Double Grip Drill 50¢
Little Giant Drill, Improved 50¢
Oneida Drill 50¢
Scroll Combination Lathe 50¢
Whitaker Mfg. Co.:
National Drill 25¢

Clamps—

Adjustable Hammers 20¢
Carriage Makers', P. S. & W.
Co. 50¢
Besly, Parallel 35¢
Myers' Hay Rack 45¢
Lineman's Swedish Neverturn 65¢
Wood Workers' Hammers 40¢
Saw Clamps, see Vises, Saw Filer's

Cleaners, Drain,

Iwan's Champion, Adjustable 50¢
Iwan's Champion, Stationary 40¢

Sidewalk—

Star Socket, All Steel, 3/4 doz. \$1.05 net
Star Shank, All Steel, 3/4 doz. \$3.24 net
W. & C. Shank, All Steel, 3/4 doz.,
7 1/2 in., \$3.00; 8 in., \$3.25.

Cleavers, Butchers—

Foster Bros. 30¢
Fayette R. Plumb 30¢
L. & I. J. White Co. 30¢

Clippers, Horse and

Chicago Flexible Shaft Co.:
1902 Chicago Horse, each. \$10.75
20th Century Horse, each. \$5.00
Lightning Belt Horse, each. \$15.00
Chicago Belt Horse, each. \$20.00
Stewart's Enclosed Gear
Horse each. \$6.75
Stewart's Patent Sheep Shear-
ing Machine, each. \$12.75
Stewart Enclosed Gear Shear-
ing Machine, No. 8, each. \$9.75

Clips, Axle—

Regular Styles, list July 1, '05.
80¢ & 90¢ & 10¢

Cloth and Netting, wire

—See Wire, etc.

Cocks, Brass—

Hardware list:
Plain Bibbs, Globe, Kerosene,
Racking, Liquor, Bottling,
etc 75¢
Compression Bibbs 70¢

Coffee Mills—

See Mills, Coffee.

Collars, Dog—

Nickel Chain, Walter B. Stevens &
Son's list 40¢
Leather, Walter B. Stevens & Son's
list 40¢

Compasses, Dividers, &c.

Ordinary Goods 70¢ & 10¢ & 75¢

Conductor Pipe,—

L. O. L. to Dealers:
Gal. Steel Charcoal.
Northeastern. 70¢ & 10¢ 50¢ & 10¢
Eastern 75¢ 50¢ & 10¢
Pittsburgh 75¢ & 10¢ 50¢
Central 75¢ & 10¢ 60¢
Northeastern 75¢ & 10¢ 60¢
Western 70¢ & 10¢ 50¢
Tennessee 70¢ & 10¢ 50¢
Southern 70¢ 50¢ & 10¢
Southwestern. 70¢ 50¢ & 10¢

Terms, 60 days: 2% cash 10 days. Fac-
tory shipments generally delivered.
See also Eave Troughs.

Coolers, Water—

L. & G. Mfg. Co. 2 3 4 6 8
Galvanized. \$1.85 \$2.00 \$2.25 \$2.50 \$3.00
Galvanized, lined, side handles, 8
Each \$1.95 \$2.15 \$2.40 \$3.30 \$4.15
Southern 70¢ 50¢ & 10¢
Agate Lined 10¢

Coppers' Tools—

See Tools, Coopers'.

Coppers, Soldering—

Soldering Coppers, 3 lb. to pair
and heavier, 20¢; lighter
than 3 lb. to pair 22¢

Cord— Sash—

Braided, Drab 1b. 35¢
Braided, White, Com. Nos. 8
to 12, 20¢; No. 7, 20¢; No. 6,
21¢.
over, 1 cent less per pound.
Cable Laid Italian, lb., No. 18, 37¢
Italian, lb., A, No. 18, 25¢; B, 22¢
Common India 1b. 11¢
Cotton Sash Cord, Twisted, 18 & 20¢
Patent Russia 1b. 20¢
Cable Laid Russia 1b. 21¢
India Hemp, Br'd'd 1b. 21¢
India Hemp, Twisted 1b. 13¢
Patent India, Twisted 1b. 17¢
Pearl Braided, cotton, No. 6, 3/4 lb.
27¢; No. 7, 26¢; Nos. 8 to 12, 26¢
Eddystone, Braided, Nos. 8 to 12,
26¢; 7, 26¢; 6, 27¢.
Harmony Cable Laid Italian, Nos. 7
to 10 1b. 23¢
Wire Sash Cord 10¢
Sash Cord Attachments, per 100 \$2.00
Samson, Nos. 8 to 12:
Braided, 1/2 lb. Drab Cotton,
55¢; Italian Hemp, 40¢;
50¢; Linen, 55¢; White Cot-
ton, 50¢; Spot Cord 50¢
Massachusetts, White 1b. 40¢
Massachusetts, Drab 1b. 45¢
Phoenix, White, Nos. 8 to 12 27¢
Silver Lake, per lb.:
A, Drab, 45¢; A, White, 40¢;
B, Drab, 40¢; B, White, 35¢;
Italian Hemp, 40¢; Linen, 57¢.
See also Chain and Ribbon.

Wire, Picture—

Full Length 90¢
Short Length 90¢
Hendryx Standard Wire Picture Cord,
old list, 85¢ & 10¢
Turner & Stanton Co. Wire Picture
Cord 90¢

Cradles—

Grain 57¢

Crayons—

White Round Crayons, Cases, 100
gro., \$8.09, \$8.50 and \$9.00 accord-
ing to grade.
Zelchick's Lumber: 1/2 gro.
White and Purple, Indelible \$7.50
Blue, Red, Green, Yellow and
Terra Cotta, 65¢; Black \$1.50
Giant Lumber, 5 1/4 in. x 15-16 in.,
round, all colors, \$12.00; Indel-
ibles, \$14.00; Blacks \$10.00
Genuine Soapstone, Metal Workers',
5 in. x 1/4 in. Round, \$2.50; 5 in. x
1/4 in. Square, \$1.75; 5 x 1/2 x 3-16,
\$2.50; 5 x 1/4 x 3-16 \$3.00
Suremark, Black, \$2.25; Blue, Red
and Yellow \$2.50

Crooks, Shepherds—

Fort Madison, per doz., Heavy, \$5.50;
Light \$5.00

Crow Bars—

See Bars, Crow.

Cultivators—

Victor Garden 50¢

Cutlery, Table—

International Silver Company:
No. 12 M'd'm Knives, 1847, 3/4 doz. \$3.50
Star, Eagle, Rogers & Hamilton
and Anchor 3/4 doz. \$3.00
Wm. Rogers & Son 3/4 doz. \$2.50

Cutters—

H. H. Mayhew Co. 40¢
Red Devil 60¢
B. Mfg. Co. 40¢
Woodward 50¢

Glass—

American 30¢
Nos. 40¢ 40¢ 40¢ 40¢ 40¢ 40¢
Each \$5 \$7 \$10 \$12 \$25 \$30 \$40

Meat and Food—

Enterprise:
Nos. 5 10 12 22 32
Each \$2 \$3 \$2.75 \$4.50 \$6 25¢ 35¢ 75¢
No. 202, \$1.50 40¢
P. S. & W. Co.:
Dixon's 1/2 doz. 33 1/2¢
Nos. 1 3 3 3 3 3 3 3
Ideal 10¢ 40¢ 5¢
Hales 60¢ 10¢ 5¢
Little Giant 1/2 doz. 40¢ 50¢
Nos. 305 310 312 320 322
\$35.00 \$48.00 \$14.07 \$72.00 \$68.00
New Triumph No. 635, 3/4 doz. \$24.00
Russwin Food, No. 1, \$24.00; No. 2,
\$27.00 45¢ 10¢ 10¢
Enterprise Beef Chavers 25¢ 30¢

Slaw and Kraut—

Henry Diaston & Sons:
Slaw and Kraut Cutters 35¢
Corn Graters 30¢
J. M. Mast Mfg. Co.:
Slaw Cutters, Knife 30¢
Combined Slaw Cutter and Corn
Grater 40¢

Tobacco—

All Iron, Cheap doz. \$4.25 & 4.50
Enterprise 25¢
National, 3/4 doz., No. 1, \$21; No. 2,
\$18 40¢

Diggers, Post Hole, &c—

Diaston's:
Rapid, 3/4 doz., \$24.00 25¢
Samson, 3/4 doz., \$34.00 25¢
Iwan's Improved Post Hole Auger 40¢
Vaughan Pattern Post Hole Augers,
3/4 doz., \$7.00
Perfection Post Hole Diggers, 3/4
doz. \$8.75
Split Handle Post Hole Diggers,
3/4 doz. \$7.75
Hercules Pattern, 3/4 doz. \$10.00
Kohler's, 3/4 doz., Universal, \$15.00;
Little Giant, \$12.00; Hercules,
\$10.00; Invincible, \$9.00; Rival,
\$8.50; Pioneer \$7.50
Never-Break Post Hole Diggers, 3/4
doz., \$24.00 60¢

Dividers—See Compasses.**Drawing Knives—**

See Knives, Drawing.

Dressers Emery Wheel—

Sterling Emery Wheel Dressers 35¢
Sterling Wheel Dresser Cutters 35¢

Drills and Drill Stocks—

Blacksmith's Common Drilling
Machines \$1.50 & 1.75
Breast, Millers Falls 15¢
Breast, P. S. & W. 33¢
Goodell Automatic Drill, 50¢ & 10¢
Millers Falls Automatic Drills, 33¢ & 10¢
Ratchet, Curtis & Curtis 25¢
Ratchet, Parker's 40¢
Ratchet, Weston's 40¢
Ratchet, Weston's, Style H Im-
proved 40¢
Ratchet, No. 012 40¢
Ratchet, Celebrated 40¢
Ratchet, Whitney's, P. S. & W.
Adjustable, No. 10, \$10.00; No. 1,
\$12.00 33¢

Twist Drills—

Bit Stock 70¢ & 70¢
Taper and Straight Shank,
60¢ & 10¢ & 70¢

Drivers, Screw—

Screw Driver Bits, per doz. \$5.00
Balsey's Screw Holder and Driver, 3/4
doz., 2 1/2-in., \$6; 4-in., \$7.50; 6-in.,
\$9 50¢
Buck Bros', Screw Driver Bits 30¢
Champion 50¢
Diaston's 70¢
Fray's Hol, H'dle Sets, No. 3, \$12.50
Ford's Brace Screw Drivers 40¢
Gay's Double Action Ratchets 35¢
Goodell's Auto 65¢
Mayhew's Black Handle 40¢
Mayhew's Monarch 40¢
Millers Falls, Nos. 20 and 21 25¢
Millers Falls, Nos. 11, 12, 41, 21 15¢
Smith & Hemenway Co., Never-
turn, 66%"; Elmora, 2" 30¢
Swan's:
Nos. 7565 to 7567 No. 7549,
19¢ & 10¢

Eave Trough, Galvanized—

Territory Gal. Steel Charcoal.
Northeastern. 75¢ & 10¢ 60¢ & 10¢
Eastern 80¢ & 10¢ 60¢ & 10¢
Pittsburgh 80¢ & 10¢ 65¢ & 10¢
Central 80¢ & 10¢ 65¢ & 10¢
Northwestern. 80¢ & 10¢ 65¢ & 10¢
Western 80¢ & 10¢ 60¢ & 10¢
Tennessee 80¢ & 10¢ 60¢ & 10¢
Southern 80¢ 60¢ & 10¢
Southwestern. 75¢ & 10¢ 60¢ & 10¢

Terms, 25 for cash. Factory shipments
generally delivered.
Note—Lower prices are made in some
sections.

Elbows and Shoes—

Factory shipments, all territories:
Galv. Steel and Galv. C. I.
Standard Gauge 85¢ & 85¢
No. 26 50¢
No. 24 25¢
No. 22 10¢

Elbows, Stove Pipe—

Edwards, Standard Blue 40¢ & 10¢
Edwards, Royal Blue 40¢ & 10¢
Reeves, Dover, one piece 40¢ & 10¢

Emery, Turkish—

1 to 5 1/2 to
46: 220: Flour.
Kegs 1b. 5 1/2 5 1/2 3 1/2
1/2 Kegs 1b. 5 1/2 5 1/2 3 1/2
1/4 Kegs 1b. 5 1/2 5 1/2 3 1/2
10-lb. cans,
10 in case, 6 1/2 7 1/2 6 1/2
10-lb. cans, less
than 10 10 1/2 10 1/2 8 1/2
Less quantity, 10 1/2 10 1/2 8 1/2
NOTE—In lots 1 to 3 tons a discount of
10% is given.

Extractors, Lemon Juice—

—See Squeezers, Lemon.

Fasteners, Blind—

Zimmerman's	50&10%
Walling's	40&10%
Upson's Patent	40%

Cord and Weight—

Ives and Titan	33 1/4%
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Corrugated—

Acme Corrugated Fasteners	70%
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Faucets—

Cork Lined	50&10@60%
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Metallic Key, Leather Lined	60&10@70%
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Red Cedar	40&50@10&10&5%
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Petroleum	70&10@75%
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B. & L. B. Co.	60&10%
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Metal Key	60&10%
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Star	50&10%
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West Lock	50&10%
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John Sommer's Peerless Tin Key	40%
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John Sommer's Boss Tin Key	40%
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John Sommer's Victor Mtl. Key	50&10%
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John Sommer's Duplex Metal Key	40%
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John Sommer's Diamond Lock	40%
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John Sommer's I.X.L. Cork Lined	50%
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John Sommer's Reliable Cork Lined	50&10%
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John Sommer's Chicago Cork Lined	60%
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John Sommer's O. K. Cork Lined	50%
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John Sommer's No Brand, Cedar	50%
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John Sommer's Perfection, Cedar	40%
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Self Measuring	40%
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Enterprise, 1/2 doz.	\$36.00
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Lane's, 1/2 doz.	\$36.00
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National Measuring, 1/2 doz.	\$36.00
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Grease, Axle—

Common Grade	gro. \$6.00@86.50
Dixon's Everlasting	10-lb. pails, ea.
55¢; in boxes, 1 doz.	1 lb. \$1.20
2 lb.	\$2.00

Griddles, Soapstone—

Pike Mfg. Co.	33 1/4% @ 33 1/4% & 10%
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Grinders—

Royal Mfg. Co.	
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Alundum Grinding Machines, each	
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Nos. 01, \$1.75; 1A, \$2.50; 10,	\$3.00
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Alundum Sickle Grinders, each	
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Nos. 20, \$5.00; 20A, \$6.00; 20A	Combined, \$6.50
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Alundum Disc Grinders, each	\$2.50
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Grindstones—	
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Pike Mfg. Co.	
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Improved Family Grindstones, 1/2	inch, 1/2 doz., \$2.00
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Richards Mfg. Co., Eli and Cycle	Ball Bearing, mounted
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Richards Mfg. Co., Eli and Cycle

Pinking Irons—

See Irons, Pinking.

Pins, Escutcheon—

Brass 50¢@50¢10¢
 Iron, list Nov. 11, '85. 60¢@60¢10¢

Pipe, Cast Iron Soil—

Standard, 2-6 in. 60¢5¢10¢
 Extra Heavy, 2-6 in. 70¢5¢10¢
 Fittings, Standard and Heavy,
 70¢10¢75¢

Pipe, Merchant—

Consumers, Carloads, Steel.		Iron.	
Blk. Galv.	Blk. Galv.	Blk. Galv.	Blk. Galv.
1/8 and 1/4 in. 66	50	61	54
3/8 in. 68	54	66	52
1/2 in. 70	58	68	56
3/4 to 6 in. 74	63	72	62
7 to 12 in. 71	56	69	54

Pipe, Vitrified Sewer—

Carload lots.
 Standard Pipe and Fittings, 3
 to 2 1/2 in., f.o.b. factory:
 First-class 87¢
 Second-class 90¢

Pipe, Stove—

	Per 100 joints.
Edwards' Nested:	
5 in., Standard Blue.....	\$6.25
6 in., Standard Blue.....	7.25
7 in., Standard Blue.....	7.75
5 in., Royal Blue.....	7.00
6 in., Royal Blue.....	7.50
7 in., Royal Blue.....	8.50
Wheeling Corrugating Co.'s Nested:	
5 in., Uniform Color.....	\$6.15
6 in., Uniform Color.....	6.65
7 in., Uniform Color.....	7.65

Planes and Plane Irons—**Wood Planes—**

Bench, first qual. 30¢@30¢10¢
 Bench, second qual. 40¢@40¢10¢
 Molding 25¢@25¢10¢
 Chapin-Stephens Co.:
 Bench, first quality 30¢
 Bench, second quality 40¢
 Molding and Miscellaneous 25¢
 Toy and German 30¢
 Union 60¢

Iron Planes -

Chaplin's Iron Planes 50¢@10¢
 Union 60¢

Plane Irons—

Wood Bench Plane Irons, list
 Dec. 12, '06 25¢
 Duck, 12" 30¢
 Chapin-Stephens Co. 25¢
 Union 50¢
 L. & I. J. White 20¢@25¢

Planters, Corn, Hand—

Kohler's Eclipse 1/2 doz. \$8.00

Plates—

Fellor 1/2 doz. 3/4 @ 1/4¢

Pliers and Nippers -

Button Pliers 75¢5¢@75¢10¢5¢
 Gas Burners, per doz., 5 in., \$1.25
 6 in., \$1.45 1.50
 Gas Pipe, 7 8 10 12-in.
 \$2.00 \$2.25 \$2.75 \$3.50

Acme Nippers 50¢5¢
 Cronk & Carrier Mfg. Co.:
 American Button 80¢
 Improved Button 75¢10¢
 Cronk's 60¢
 No. 80 Linemen's 50¢
 Stub's Pattern 45¢
 Combination and others 35¢
 Heller's Farriers' Nippers, Pliers
 and Tools 40¢5¢@40¢10¢5¢
 P., S. & W. Timmers' Cutting Nip-
 pers 40¢
 Swedish Side, End and Diagonal
 Cutting Pliers 50¢
 Utica Drop Forge & Tool Co.:
 Pliers and Nippers, all kinds 40¢

Plumbs and Levels—

Chapin-Stephens Co.:
 Plumbs and Levels 30¢@30¢10¢
 Chapin's Imp. Brass Cor. 40¢@40¢10¢
 Pocket Levels 30¢@30¢10¢
 Extension Sights 30¢@30¢10¢
 Machinists' Levels 40¢@40¢10¢
 Disston's Plumbs and Levels 60¢10¢
 Disston's Pocket Levels 60¢10¢
 Stanley's Dux 35¢
 Woods' Extension 33¢

Points, Glaziers'—

Bulk and 1-lb. papers 1/2 doz. 9¢
 1/2-lb. papers 1/2 doz. 9¢
 1/4-lb. papers 1/2 doz. 10¢

Police Goods—

Manufacturers' Lists 25¢@25¢5¢
 Tower's 25¢

Polish—Metal, Etc—

Prestoline Liquid, No. 1 (1/4 pt.), 1/2
 doz., \$3.00; No. 2 (1 qt.), \$0.00 40¢
 Prestoline Paste 40¢

George William Hoffman:
 U. S. Metal Polish Paste, 3 oz.
 boxes, 1/2 doz. 50¢; 1/2 doz. \$4.50;
 1/2 lb. boxes, 1/2 doz. \$1.25; 1 lb.
 boxes, 1/2 doz. \$2.25
 U. S. Liquid, 8 oz. cans, 1/2 doz.,
 \$1.25
 Barkeepers' Friend Metal Polish, 1/2
 doz., \$1.75

Stove—

Black Eagle Benzine Paste, 5 lb. cans,
 1/2 lb 10¢
 Black Eagle, Liquid, 1/2 pt. cans
 1/2 doz. 75¢
 Black Jack Paste, 1/4 lb cans, 1/2 gr. \$9.00
 Black Kid Paste, 5 lb cans, each, \$0.65
 Ladd's Black Beauty Liquid, per
 100 tins \$6.75
 Joseph Dixon, 1/2 gr. \$5.75 10¢
 Dixon's Plumbago 1/2 lb 8¢
 Fireside 1/2 gr. \$2.50
 Gem, 1/2 gr. \$4.50 10¢
 Japanese 1/2 gr. \$3.50
 Jet Black 1/2 gr. \$3.50
 Peerless Iron Enamel, 10 oz. cans
 1/2 doz. \$1.50

Window Polish—

Benj. P. Forbes:
 Glasbright, No. 2, gal pails, 1/2 doz.,
 \$24.00; each, \$2.50; 1 lb cans,
 each 75¢
 Glasbright Powder, bbls., 1/2 lb. 20¢

Poppers, Corn—

1 qt. Square doz. \$0.80; gro. \$8.75
 1 qt. Round doz. \$0.90; gro. \$10.00
 1/2 qt. Square doz. \$1.00; gro. \$11.00
 2 qt. Square doz. \$1.25; gro. \$13.50

**Post Hole and Tree Au-
g-ers and Diggers—**

See also Diggers, Post Hole, &c.

Posts, Steel—

Steel Fence Posts, each, 5 ft., 42¢;
 6 ft., 46¢; 6 1/2 ft., 48¢
 Steel Hitching Posts each \$1.30

Potato Parers—

See Parers, Potato.

Pets, Glue—

Enamelled 40¢
 Tinned 50¢@10¢

Powder—

In Cans:
 Duck, 1 lb. each 45¢
 Fine Sporting, 1 lb. each 75¢
 Rifle, 1/2 lb. each 14¢
 Rifle, 1 lb. each 25¢
 In Kegs:
 12 1/2-lb. kegs \$3.50
 25-lb. kegs \$4.60
 King's Semi-Smokeless:
 Keg (25 lb bulk) \$6.50
 Half Keg (12 1/2 lb bulk) \$3.50
 Quarter Keg (6 1/4 lb bulk) \$1.90
 Case 24 (1 lb cans bulk) \$8.50
 Half case (1 lb cans bulk) \$4.50
 King's Smokeless:
 Shot Gun, Rifle,
 Keg (25 lb bulk) \$12.00 \$15.00
 Half Keg (12 1/2 lb bulk) 6.25 7.75
 Quarter Keg (6 1/4 lb bulk) 3.25 4.00
 Case 24 (1 lb cans bulk) 11.00 17.00
 Half case 12 (1 lb c. bk) 7.25 8.75

Presses—**Fruit and Jelly—**

Enterprise Mfg. Co. 20¢@25¢

Seal Presses—

Morrill's No. 1, 1/2 doz., \$20.00 50¢

Pruning Hooks and Shears**See Shears.****Pullers, Nail—**

Cyclops 50¢
 Miller's Falls, No. 3, 1/2 doz., \$12.00
 33¢@10¢
 Morrill's No. 1, Nail Puller, 1/2 doz.,
 \$20.00 50¢
 Pearson No. 1, Cyclone Spike Puller,
 each \$30.00 50¢
 The Seranton Co. Case Lots:
 No. 2B (large) \$5.50
 No. 3B (small) \$5.00
 Smith & Hemenway Co.:
 Diamond B 70¢
 Giant 50¢
 Staple Pullers, Utica and Davi-
 son 60¢

Pulleys, Single Wheel—

Inch	1 1/4	1 3/4	2	3
Avening or Tackle, doz.	\$0.30	.35	.60	1.05
Hay Fork, Squirrel or Solid Eye, doz., 4 in., \$1.25; 5 in., \$1.50				
Inch 2	2 1/4	2 1/2	2 3/4	
Hot House, doz.	\$1.65	.85	1.20	
Inch 1 1/4	1 1/2	1 3/4	2	
Screw, doz.	\$0.16	.19	.23	.20
Inch 1 1/4	1 1/2	1 3/4	2	
Side, doz.	\$0.25	.40	.55	.60
Inch 1 1/4	1 1/2	1 3/4	2	2 1/2

Sash Pulleys—

Common Frame; Square or
 Round End, per doz., 1 1/4 and
 2 in. 17¢@20¢
 Auger Mortise, no Face Plate,
 per doz., 1 1/4 and 2 in. 20¢@21¢
 Acme, No. 35, 1 1/4 in., 19¢; 2 in., 20 1/2¢
 American Pulley Co.:
 Wrought Steel American Plain
 Axle 50¢@10¢
 Wrought Steel, Eagle 17¢@20¢
 Top Notch, Electrically Welded,
 Nos. 3 and 4 19¢
 Fox-All-Steel, Nos. 3 and 7, 2 in.
 1/2 doz. 50¢
 Grand Rapids All Steel Noiseless 50¢
 Niagara No. 25, 1 1/4 in., 19¢; 2
 in. 20 1/2¢
 No. 26 Troy, 1 1/4 in., 14 1/2¢; 2 in., 16 1/2¢
 Star, No. 26, 1 1/4 in., 19¢; 2 in., 20 1/2¢
 Tackle Blocks—See Blocks.

Pumps—

Cistern 60¢
 Pitcher Spout 75¢5¢@75¢10¢
 Wood Pumps, Tubing, &c. 50¢
 Barnes Dbl. Acting (low list) 40¢5¢
 Barnes Pitcher Spout 75¢@10¢
 Contractors' Rubber Diaphragm, No.
 2, B. & L. Block Co. \$16.00
 Daisy Spray Pump 1/2 doz. \$6.50
 Flint & Walling's Fast Mail Hand
 (low list) 50¢
 Flint & Walling's Fast Mail (low
 list) 50¢
 Flint & Walling's Tight Top
 Pitcher 75¢@10¢
 National Specialty Mfg. Co., Measur-
 ing, Nos. 2, \$6.00; 3, \$5.50 30¢
 Myers' Pumps (low list) 40¢5¢
 Myers' Power Pumps 40¢5¢
 Myers' Spray Pumps 40¢5¢

Pump Leathers—

Plunger and Valve Leathers—Per
 gro.:

No.	1	2	3	4
\$5.00	6.00	7.00	8.00	

 Cup Leathers—Per 100:

Inch.	2 1/2	3	3 1/2	4
\$5.00	7.00	9.00	12.00	

Punches—

Saddlers' or Drive, good,
 doz. 50¢@75¢
 Spring, single tube, good qual-
 ity \$1.75
 Revolving (4 tubes) doz. \$3.50
 Bemis & Call Co.'s Cast Stl Drive-50
 Morrill's Nos. 1AA, 1A, 1B, 1C,
 1D, \$15.00 50¢
 Hercules, 1 die, each \$5.00 50¢
 Niagara Hollow Punches 55¢10¢
 Niagara Solid Punches 55¢10¢
 Timmers' Hollow, P., S. & W. Co. 40¢
 Timmers' Solid, P., S. & W. Co., 1/2
 doz., \$1.44 40¢

Rail—Barn Door, &c.—

Sliding Door, Painted Iron,
 2 1/2 @ 2 3/4¢
 Sliding Door, Wrought Brass,
 1 1/2 in., 1 lb., 36¢ 30¢
 Alitch Mfg. Co.: Reliable Hanger
 Track 50¢
 Cronk's:
 Double Braced Steel Rail, 1/2 ft. 3 1/4¢
 O. N. T. Rail \$3.12
 Griffin's:
 2xx, 100 ft., 1 x 3-16 in., \$3.25;
 1 1/4 x 3-16 in., \$3.75,
 Hinged Hanger, 100 ft., 1 x 3-16
 in., \$3.50; 1 1/4 x 3-16 in., \$4.00.
 Lane's:
 Hinged Track, 100 ft. \$3.45
 O. N. T., 100 ft., 1 in., \$3.00; 1 1/4
 in., \$3.45; 1 1/2 in., \$4.00.
 Standard, 1 1/4 in., 100 ft. \$4.00
 Lawrence Bros.:
 1 x 3-16 in., 100 ft., \$7.50; 1 1/4 x
 3-16 in., \$8.75 55¢@7 1/2¢
 McKinney's:
 Hinged Hanger Track, 1/2 ft., 11¢.
 1 x 3-16 Track 55¢@5¢
 Myers' Stayon Track 60¢5¢
 Richards Mfg. Co.:
 Common, 1 x 3-16 in., \$3.00; 1 1/4 x
 3-16, \$3.25; 1 1/2 x 3-16, \$3.50.
 Special Hinged Hanger Rail, 60¢@10¢
 Lag Screw Rail, No. 65 50¢
 Gauge Trolley Track, 1/2 ft., No. 31,
 1/2¢; No. 32, 1 1/4¢; No. 33, 20¢
 No. 50, 61, \$3.00; 62, \$3.25; 63, \$3.50; 64,
 \$4.00; 45, \$3.25; 46, \$3.50; 49, No. 1,
 \$3.25; 49, No. 2, \$3.50.

Rakes—

NOTE—Many goods are sold
 at net prices.
 Fort Madison Red Head Lawn \$3.25
 Fort Madison Blue Head Lawn \$2.75
 Cronk's:
 Steel Garden: Champion, 75%;
 Ideal, 80%; Victor, 80¢@25¢
 Queen City Lawn, 1/2 doz., 20 teeth,
 \$2.85; 24, \$3.00 net
 Anticlog Lawn, 1/2 doz. \$4.00
 Malleable Garden 70¢@10¢
 Ideal Steel Garden, 1/2 doz., 12 teeth,
 \$15.00; 14, \$16.00; 16, \$18.00 80¢
 Lawn's:
 Queen, 20-tooth 1/2 doz. \$3.15
 Lawn Queen, 24-tooth 1/2 doz. \$3.25
 Paragon, 20-tooth 1/2 doz. \$2.70
 Paragon, 24-tooth 1/2 doz. \$2.75
 Steel Garden, 14-tooth 1/2 doz. \$2.40
 Malleable Garden, 14-tooth, 1/2 doz.,
 \$2.00@2.25

Resps, Horse—

Disston's 75¢
 Heller Bros. 70¢5¢@70¢10¢5¢
 Livright Bros.' Gold Medal 70¢@10¢75¢
 McCaffrey's American Standard
 60¢@10¢5¢
 New Nicholson 70¢@10¢75¢
 See also Files.

Razors—

Liana Bo-ras-ic 60¢
 Fox Razors, 1/2 doz., No. 42, \$3.00; 1/2
 No. 44, \$2.00; No. 82, Platina 40¢
 Red Devil 65¢

Reels, Fishing—

Hendryx:
 M 6, Q 6, A 6, B 6, M 9 1/4, M 16,
 Q 16, A 16, B 16, 1008, Rubber,
 Popolo, Nickled Popolo 20¢
 Aluminum, German Silv., Bronze, 25¢
 1240 N, 124 N 20¢
 3004 N, 06 N, 6 RM, G 9 25¢
 4 N, 6 PN, 24 N, 28 PN 20¢
 2904 P, 33 1/2%; 2904 PN, 33 1/2%;
 0924 N, 33 1/2%; 02081 N, 33 1/2%;
 002904 PN, 33 1/2%; 002 N, 33 1/2%;
 986 PN, 2904 N, 974 PN 25¢
 5009 PN, 5009 N 20¢
 Competitor, 102 P, 102 PN, 202 P,
 202 PN, 102 PR, 202 PR 20¢
 304 P, 304 PN, 03304 P, 00304 PN, 33 1/2%

Registers—List July 1, 1903.

Japanned, Electroplated and
 Bronzed 70¢
 White Porcelain Enamel 50¢@10¢
 Solid Brass or Bronze Metal 40¢

Revolvers—

Single Action 25¢@1.00
 Double Action, except 1/4 cal. \$2.00
 Double Action, 1/4 caliber \$2.00
 Automatic \$4.00
 Hammerless \$4.50

Riddles, Hardware Grade

16 in. per doz. \$2.50@2.75
 17 in. per doz. \$2.75@3.00
 18 in. per doz. \$3.00@3.25

Rings and Ringers—**Bull Rings—**

	2 1/2	3 in.
Steel \$0.70	0.75	0.80 doz.
Copper \$1.10	1.25	1.65 doz.

Hog Rings and Ringers—

Hill's Rings, gro. boxes \$1.50@1.50
 Hill's Ringers, Gray Iron, doz.,
 60¢@75¢
 Hill's Ringers, Malleable Iron,
 doz., 80¢@95¢
 Blair's Rings, per gro. \$5.00@5.50
 Blair's Ringers, per doz. 75¢@90¢

Rivets and Burrs—

Copper 50¢@50¢5¢
 Carriage, Coopers', Timmers', &c.:
 Black 70¢@10¢
 Metallic Tinned 70¢

Bifurcated and Tubular—

Assorted in Boxes.
 Bifurcated, per doz. boxes, paste-
 board boxes, 50 count, 23¢@25¢;
 Tin boxes, 100 count, 29¢@32¢.
 Tubular, per doz. boxes, 50 count,
 29¢@32¢; 100 count, 51¢@58¢.

Rollers—

Cronk's Stay, No. 50 \$1.00
 Cronk's Brinkerhoff No. 55, \$0.60;
 No. 56, \$0.75; No. 63 \$0.75
 Lane's Stay 40¢
 Richards' Stay:
 Handy Adj. and Reversible No. 53, 75¢
 O. K. Adj. and Reversible No. 58, 50¢
 Lag Screws, Nos. 55 and 57 50¢
 Underwriters', Nos. 59, 60 50¢
 Favorite, No. 54 60¢

Rope—

Manila, 7-16 in. diam. and larger:
 Pure 1/2 lb. 10¢@10 1/4¢
 Sisal, 7-16 in. diam. and larger:
 Pure 1/2 lb. 7 1/2¢@7 1/4¢
 Sisal, 7-16 in. diam. and larger:
 lower grade 1/2 lb. 6 1/2¢@7¢
 Sisal, Hay, Hide and Bale
 Ropes, Medium and Coarse:
 Mixed 1/2 lb. 6 1/2¢@6 1/4¢
 Pure 1/2 lb. 7 1/4¢@7 1/2¢
 Sisal, Tarred, Medium Lath
 Yarn, Coarse and Untarred:
 Mixed 1/2 lb. 5¢@5 1/4¢
 Pure 1/2 lb. 6 1/2¢
 Cotton Rope:
 Best, 1/4-in. and larger 18¢@20¢
 Medium, 1/4-in. and larger 16¢@17¢
 Common, 1/4-in. and larger 10¢
 In coils, 1/2 advance.

Jute Rope:
 Thread, No. 1, 1/4-in. and up,
 1 lb. 6 1/4¢
 Thread, No. 2, 1/4-in. and up,
 1 lb. 5 1/4¢

Wire Rope—

Galvanized 37 1/4¢@2 1/4¢
 Plain 35¢@2 1/4¢

Ropes, Hammock—

Covert Mfg. Co.:
 Jute, 35%; Sisal 20¢

Rules

Boxwood 60¢@60¢10¢
 Ivory 35¢@10¢35¢10¢5¢
 Chapin-Stephens Co.:
 Boxwood 60¢
 Flexfold 40¢
 Ivory

Saws—

Atkins' Circular Saws.....	45%
Band Butcher Saws.....	50@104.10
Cross Cuts.....	35%
One-Man Cross Cut.....	40%
Narrow Cross Cut.....	50%
Hand, Rip and Panel.....	35@45
Miter Box and Compass.....	40%
Mulay, Mill and Drag.....	45%
Wood Saws.....	40@10
Chapin-Stephens Co.: Turning Saws and Frames.....	30@104.10
Diamond Saw & Stamping Works: Sterling Kitchen Saws.....	30@104.10
Diston's: Circular, Solid and Ins'ted Tooth.....	50%
Band, 2 to 16 in. wide.....	60%
Hand, 4 to 12.....	60%
Crosscuts.....	45%
Narrow Crosscuts.....	50%
Mulay Mill and Drag.....	50%
Framed Woodsaws.....	25%
Woodsaw Blades.....	25%
Woodsaw Rods, Tuned.....	15%
Hand Saws, Nos. 12, 9, 9, 16, d. 10, D. 12, 7, 7, 7.....	25%
Hand Saws, Nos. 7, 107, 107, 3, 1, 0, 00, Combination.....	30%
Compass, Key Hole, &c.....	25%
Butcher Saws and Blades.....	30%
C. E. Jennings & Co.'s: Buck Saws.....	16%
Butcher Saws.....	45%
Compass and Key Hole Saws.....	33@74
Framed Wood Saws.....	25@74
Hand Saws.....	124
Wood Saw Blades.....	33@74
Millers Falls: Star Saw Blades.....	15@10
Star Saw Blades.....	15@10
Massachusetts Saw Works: Victory Kitchen Saws.....	40@104.50
Butcher Saws and Blades.....	35@40
Peace & Richardson's Hand Saws.....	30%
Simonds': Circular Saws.....	45%
Crescent Ground Cross Cut Saws.....	40@10
One-Man Cross Cuts.....	40@10
Gang Mill, Mulay and Drag Saws.....	45%
Band Saws.....	50%
Back Saws.....	25@254
Butcher Saws.....	35@354
Hand Saws.....	25@254
Compass, Key Hole, &c.....	45%
Wood Saws.....	40@74
Wheeler, Madden & Clemon Mfg. Co.'s Cross Cut Saws.....	50%

Hack Saw Blades and Frames—

Atkins' Hack Saw Blades A A A.....	25%
Diston's: Concave Blades.....	35%
Keystone Blades.....	30%
Hack Saw Frames.....	30%
Simonds' File Co.: Hack Saw Frames, Nos. 175, 180.....	40@74
Hack Saws, Nos. 175, 180, complete.....	40@74
Goodell's Hack Saw Blades.....	40@10
Griffin's Hack Saw Frames.....	35@54.10
Griffin's Hack Saw Blades.....	35@54.10
Star Hack Saws and Blades.....	15@10
Sterling Hack Saw Blades.....	30@104.50
Sterling Hack Saw Frames.....	30@104.50
Sterling Power Hack Saw Machines, each, No. 1, \$25.00; No. 2, \$30.00.....	10%
Victory Hack Saw Blades.....	30%
Victory Hack Saw Frames.....	40%
Whitaker Mfg. Co.: National Hand Blades.....	40%
National Hand Frames.....	30@5
National Power Blades.....	30@10

Scroll—

Barnes, No. 7, \$15.....	25%
Barnes' Scroll Saw Blades.....	40%
Barnes' Velocipede Power Scroll Saw, without boring attachment, \$30.....	10%
with boring attachment, \$30.....	15@10
Lester, complete, \$10.00.....	15@10
Rogers, complete, \$3.50 and \$4.00.....	15@10

Scales—

Union Platform, Plain.....	\$2.10 @ 2.20
Union Platform, Stpd.....	\$2.20 @ 2.30
Chatillon's: Eureka.....	25%
Favorite.....	40%
Grocers' Trip Scales.....	50%
The Standard Portables.....	40%
The Standard R. R. and War- on.....	50@10

Scrapers—

Box, 1 Handle.....	doz. \$1.85 @ 2.10
Box, 2 Handle.....	doz. \$2.35 @ 2.50
Ship.....	Light, \$2.00; Heavy, \$1.50
Chapin-Stephens Co., Box.....	30@104.10
Richards Mfg. Co., Foot.....	60%

Screws—Bench and Hand

Bench, Iron, doz., 1 in.....	\$2.50 @ 2.75
1 1/4.....	\$3.00 @ 3.25
1 1/2.....	\$3.50 @ 3.75
Bench, Wood.....	20@20.10
Hand, Wood.....	70@104.10
Chapin-Stephens Co., Hand.....	70@104.10

Coach, Lag and Hand Rail—

Lag, Cone Point.....	80@5 @ 80@10
Coach, Gimlet Point.....	80@104.50
Hand Rail.....	70@104.75

Jack Screws—

Standard List.....	70@104.75
Millers Falls.....	50@104.10
Swett Iron Works.....	70@75

Machine—

Cut Tread, Iron, Brass or Bronze: Flat Head or Round Head.....	50@50.10
Fillister Head.....	40@104.10

Rolled Thread, F. H. or R. H.,
Iron.....75@10%
F. H. or R. H., Brass, Nos.
8 to 14.....65@10%

Set and Cap—

Set (Iron).....	75@104.75
Set (Steel), net advance over Iron.....	25%
Sq. Hd. Cap.....	70@104.75
Hex. Hd. Cap.....	70@104.75
Rd. Hd. Cap.....	50@74
Fillister Hd. Cap.....	60@74

Wood—

List July 23, 1903. Flat Head, Iron.....	87@45@
Round Head, Iron.....	85@45@
Flat Head, Brass.....	80@45@
Round Head, Brass.....	77@45@
Flat Head, Bronze.....	75@45@
Round Head, Bronze.....	72@45@
Drive Screws.....	87@45@

Scroll Saws—

See Saws, Scroll.

Scythes—

Per doz.

Grass, No. 1, Plain.....	\$7.00
Clipper, Bronzed Webb.....	\$7.25
No. 3 Clipper, Pol'd Webb.....	\$7.50
No. 6 Clipper and Solid Steel.....	\$7.75
Bush, Weed and Bramble, Nos. 11, 12 and 13.....	\$7.25
Grain, No. 1.....	\$9.00 @ 9.50
Bronzed Webb, No. 1.....	\$9.25 @ 9.75
Nos. 3 and 4 Clipper, Grain.....	\$9.50 @ 10.00
Solid Steel, No. 6.....	\$10.00 @ 10.50

Seeders, Raisin—

Enterprise.....	25@30%
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Sets—Awl and Tool—

Fray's Adj. Tool Handles, Nos. 1, \$12; 2, \$16; 3, \$12.....	50%
Millers Falls Adj. Tool Handles, No. 1, \$12; No. 4, \$12; No. 5, \$18.....	20@10

Garden Tool Sets—

Ft. Madison Three Plows, Hoe, Rake and Shovel.....	per doz, sets \$3.00
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Sets, Nail—

Octagon.....	gro. \$3.50 @ 3.75
Buck Bros.....	274%
Cannon's Diamond Point, per doz.....	40@10
Mayhew's.....	per gro. \$3.00
Snell's Corrugated, Cup Pl.....	40@10
Snell's Knurled, Cup Pl.....	40@10
Victor Knurled, Cup Pl.....	per doz, \$7.50

Rivet—

Regular list.....	75@75@10%
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Saw—

Atkin's: Criterion.....	40%
Adjustable.....	40%
Diston's Star, Monarch and Tri- umph.....	30%
Morrill's No. 1.....	\$15.00
Nos. 3 and 4, Cross Cut.....	\$20.00
No. 5, Mill.....	\$30.00
Nos. 10, 11, 95.....	\$15.00
No. 1 Old Style.....	\$10.00
Special.....	\$12.25
Giant Royal Cross Cut.....	per doz, \$8.00
Royal, Hand.....	per doz, \$4.50
Taintor Positive.....	per doz, \$6.75

Shaving—

Fox Shaving Sets, No. 33.....	per doz, net, \$24.00
Smith & Hemenway Co.'s.....	75%

Sharpeners, Knife—

Pike Mfg. Co.: Fast Cut Pocket Knife Hones, per doz.....	\$1.50
Mounted Kitchen Sand Stone, per doz.....	\$1.50
Natural Grit Carving Knife Hones, per doz.....	\$3.00
Quick Cut Emery Carving Knife Hones, per doz.....	\$1.50
Quick Edge Pocket Knife Hones, per doz.....	\$2.50

Skate—

Smith & Hemenway Co., Eureka.....	50%
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Shaves, Spoke—

Iron.....	doz. \$1.25
Wood.....	doz. \$2.00
Bailey's (Stanley R. & L. Co.).....	45%
Chapin-Stephens Co.....	30@30@10
Goodell's.....	per doz, \$3.00.....15@10

Shears—

Cast Iron.....	7 8 9 in.
Best.....	\$16.00 18.00 20.00 gro.
Good.....	\$13.00 15.00 17.00 gro.
Cheap.....	\$5.00 6.00 7.00 gro.
Straight Trimmers, &c.....	Best quality Jap.....70@70@10
Best quality Nickel.....	60@60@10
Tailors' Shears.....	40@40@10
Acme Cast Shears.....	40@40@5
Heinrich's Tailor's Shears.....	30@10
National Cutlery Co.'s Nickel Plated, 60@10%; Japan Handles.....	70@10
Wilkinson Shear & Cutlery Co.: Sheep, 1900 list.....	30@104.5
Grass.....	50@10
Horse or Mule.....	50@10
J. Wiss & Sons Co.: Best Quality Jap'd.....	61@10
Best Quality Nickle'd.....	50@10
Tailors'.....	25%

Tinners' Snips—

Steel Blades.....	80@80 @ 20@10
Steel Laid Blades.....	40@10 @ 50%

Forged Handles, Steel Blades, Ber-
lin.....50%
Heinrich's Snips.....40%
Jennings & Griffin Mfg. Co.'s 6 1/4 to
10 in.....33@74
National Cutlery Co.'s Forged Steel.....50%
Niagara Snips.....40%
P. S. & W. Forged Handles, 25%
W. R. W.....40@10
J. Wiss & Sons Co.:
Wiss Forged Steel.....25%

Pruning Shears—

Cronk's Hand Shears.....	334%
Cronk's Wood Handle Shears.....	334%
Diston's Combined Pruning Hook and Saw, per doz.....	\$18.00.....25%
Diston's Pruning Hook only, per doz.....	\$12.00.....25%
John T. Henry Mfg. Co.: Pruning Shears, all grades.....	40%
P. S. & W. Co.....	40@10
Columbian Cutlery Co.: Hedge, Wilcut Brand.....	60@10
Lawn and Border, Wilcut Brand.....	60@10

Sheaves—Sliding Door—

Reading.....	40%
R. & E. list.....	15%

Sliding Shutter—

Reading list.....	40%
R. & E. list.....	10%

Shells—Shells, Empty—

Brass Shells, Empty: Climax, 10 and 12 gauge.....	65@10
Club, Rival, 65&5; First Quality.....	61&5

Paper Shells, Empty:

New Rapid, 10, 12, 16 and 20 gauge, 25&10%.....	25&10
Climax, 10 and 12 gauge; Acme, 10, 12, 16 and 20 gauge; Ideal, 10, 12, 16 and 20 gauge; Leader grade.....	25&5
Union League, 12 and 12 gauge; Rival grade.....	25%
*New Climax, Defiance, 10, 12, 14, 16 and 20 gauge; Climax, 14, 16 and 20 gauge.....	20&5
Challenge, Monarch, 10, 12, 16 and 20 gauge; League, Union, 14, 16 and 20 gauge; Repeater Grade.....	20%

Shells, Loaded—

Loaded with Black Powder.....	40%
Loaded with Smokeless Powder, medium grade.....	40&5
Loaded with Smokeless Powder, high grade.....	40@10@10
Union Metallic Cartridge Co.: New Club, Black Powders.....	40%
Nitro Club, Smokeless Powders.....	40&5
Arrow, Smokeless Powders.....	40@10@10
Winchester: Smokeless Repeater Grade.....	40&5
Smokeless Leader Grade.....	40@10@10
Black Powder.....	40%

Shingles, Metal—Per Sq.

Edwards Mfg. Co.: Painted.....	Galv.
14 x 20.....	\$4.25 \$5.00
10 x 14.....	4.50 6.25
7 x 10.....	4.75 6.50
Wheeling Corrugating Co.: Dixie, 14 x 20 in.....	\$4.25 \$5.50
Dixie, 10 x 14 in.....	4.50 6.00
Shoe, 7 x 10 in.....	5.00 6.75

Shoes, Horse, Mule, &c.—

F.o.b. Pittsburgh: Iron.....	per key \$4.10
Steel.....	per key \$3.85
Burden's, all sizes.....	per key \$3.90

Shot—

Drop, up to R.....	25-lb. bag \$1.80
Drop, B and larger.....	\$1.80
Drop.....	2.05
Chilled.....	2.05
Dust.....	2.30

Shovels and Spades—

Association List, Nov. 15, 1902.....	40%
Avery Stamping Co.....	40%
Snow Shovels— Long Handle.....	\$3.25 @ \$3.50
Wood and Mall, D Handle.....	\$3.75 @ \$4.00

Sieves and Sifters—

Hunter's Imitation, gro.....	\$9.50
Hunter's Genuine, per gro.....	\$12.00

Sifters, Ash—

Acme Ball Bearing Sales Co., Acme Automatic Ash Sifter, each.....	\$3.25
per doz.....	\$39.00

Sieves, Seamless Metallic

Mesh.....	1 1/2 16 18 20
Iron Wire.....	21.05 1.05 1.10 1.20
Tinned Wire.....	1.15 1.15 1.20 1.30
Nested, 10, 11 and 12 Inch. Mesh 18, Nested.....	doz. \$0.90 @ 0.95
Mesh 20, Nested.....	doz. \$1.00 @ 1.05
Mesh 24, Nested.....	doz. \$1.30 @ 1.40

Sinks, Cast Iron—

Painted, Standard list: 12 x 12 to 22 x 36 in.....	60%
20 x 24 to 24 x 50 in.....	50%
24 x 60 to 24 x 120 in.....	30%
Barnes' low list: Up to and including 20 x 36 in.....	50&5
20 x 40 to 24 x 50 in.....	45%

NOTE—There is not entire uniformity in lists used by jobbers.

Skins, Wagon—

Cast Iron.....	70@75 @ 10%
Steel.....	40@45%

Slates, School—

Factory Shipments. "D" Slates.....	50@50@10
Eureka, Unexcelled Noiseless.....	60&7 tens.
Victor A, Noiseless.....	60&4 tens @ 5%

Slaw Cutters—See Cutters.**Snaps, Harness—**

German.....	40@40@10
Covert Mfg. Co.: Derby, 25%; Yankee, 30&2%; Yankee Roller, 30&2%.....	40%
High Grade, 40%; Trojan.....	40%
Jockey.....	25%

Snaths—

Scythe.....	60%
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Snips, Tinners—See Shears.**Spoons and Forks—****Silver Plated—**

Good Quality.....	50@104.60 @ 5%
Cheap.....	60@60@10
International Silver Co.: 1847 Rogers Bros., 40&10%; Rogers & Hamilton.....	50&10
Rogers & Bro., William Rogers' Eagle Brand.....	50&10
Anchor, Rogers Brand.....	60
Wm. Rogers & Son.....	60&10

Miscellaneous

German Silver.....	60@60@5%
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Tinned Iron—

Tens.....	per gro. 50@55¢
Tables.....	per gro. 90@1.00

Springs—Door—

Bardsley's Spring and Check.....	40%
Chicago (Coil).....	40&10
Gem (Coil).....	20
Pullman Door and Gate.....	10
Reliance (Coil).....	40&10
Star (Coil).....	40
Torrey's Rod, 39 in.....	per doz. \$1.10

Carriage, Wagon, &c.—

1 1/4 in. and Wider:	Per 100 lb.
Black	\$4.75 @ \$5.00
Half Bright	\$4.75 @ \$5.00
Bright	\$5.25 @ \$5.50
Painted Seat Springs:	
1 1/2 x 2 x 26....	per pair. 45 @ 47c
1 1/2 x 3 x 28....	per pair. 68 @ 71c

Scythe Stones—

Pike Mfg. Co., 1901 list:	
Black Diamond S. S.	gro. \$12.00
Lamouille S. S.	gro. \$11.00
White Mountain S. S. . . .	gro. \$9.50
Green Mountain S. S. . . .	gro. \$7.00
Extra Indian Pond S. S. . . .	gro. \$8.00
No. 1 Indian Pond S. S. . . .	gro. \$7.50
No. 2 Indian Pond S. S. . . .	gro. \$5.00
Leader Red End S. S. . . .	gro. \$5.00
Quick Cut Emery	gro. \$10.00
Pure Corundum	gro. \$18.00
Crescent	gro. \$7.00
Emery Scythe Rifles, 2 Coat .	\$8.80
Emery Scythe Rifles, 3 Coat .	\$11.00
Emery Scythe Rifles, 4 Coat .	\$13.20
Balance of 1904 list 33 1/2%	
Electro (Artificial),	gro. \$12.00
Lightning (Artificial), . . .	gro. \$18.00
Lighting	33 1/2%

Stoppers, Bottle—

Victor Bottle Stoppers	gro. \$9.00
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Stops—Bench—

Millers Falls	15% 10%
Morrill's, . . doz., No. 1, \$10.00	50%
Morrill's, No. 2, \$12.50	50%

Door—

Chapin-Stephens Co.	50% 50% 10%
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Plane—

Chapin-Stevens Co.	20%
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Straps—Box—

Acme Embossed, case lots. 20 & 10 & 10%	
Cary's Universal, case lots. 20 & 10 & 10%	

Stretchers, Carpet—

Cast Iron, Steel Points, . doz. 55¢	
All Steel Socket, . doz. \$2.00 @ 2.25	
Excelsior Stretcher and Tack Hammer Combined, . doz., \$6.00	20%

Stuffers, Sausage—

Enterprise Mfg. Co.	25% 25% 7 1/2%
National Specialty Co., list Jan. 1, 1902	30% 5%
P. S. & W. Co.	40% 10% 5%

Sweepers, Carpet—

Bissell Carpet Sweeper Co. . . doz.	
Superba, Crotch Mahogany . . .	\$36.00
Triumph, Fancy Veneers . . .	\$33.00
Parlor Queen, Fig. Rosewood . .	\$39.00
Elite, Hungarian Ash . . .	\$39.00
Am. Queen, Fig. Mahogany . . .	\$37.00
Ideal, Bird's-Eye Maple . . .	\$25.00
Grand Rapids, Nickel . . .	\$24.00
Japan	\$22.00
Standard, Nickel, \$22.00; Japan, \$20.00	
Crown Jewel, Nickel, \$21.00; Jap. \$19.00	
Crystal, Glass Top . . .	\$36.00
Grand, 17 in. wide . . .	\$36.00
Parlor Grand . . .	\$48.00
Club, 24 in. wide . . .	\$54.00
Hall 28 in. wide . . .	\$60.00

NOTE.—Rebates: 50¢ per dozen on three dozen lots; \$1 per dozen on five dozen lots; \$2 per dozen on ten dozen lots; \$3.50 per dozen on twenty-five dozen lots.

Tacks, Finishing Nails, &c.

American Carpet Tacks . . .	90¢ 40%
American Cut Tacks . . .	90¢ 40%
Swedish Cut Tacks . . .	90¢ 40%
Swedish Upholsterers' . . .	90¢ 40%
Gimp Tacks . . .	90¢ 40%
Lace Tacks . . .	90¢ 40%
Trimmers' Tacks . . .	90¢ 40%
Looking Glass Tacks . . .	65%
Bill Posters' and Railroad Tacks .	90¢ 50¢ 10%
Hungarian Nails . . .	80¢ 20%
Finishing Nails . . .	70%
Trunk and Clout Nails . . .	80¢ 10%

NOTE.—The above prices are for Straight Weights.

Miscellaneous—

Double Pointed Tacks . . .	90¢ 46 tens @—%
See also Nails, Wire.	

Tanks, Oil and Gasoline—

Wilson & Friend Co.:	
Gal. Gasoline	Oil
30	\$2.75
60	\$3.50
110	\$5.00
	\$5.75

Tapes, Measuring—

American Asses' Skin . . .	50¢ @—%
Patent Leather . . .	25¢ @ 30¢ 5%
Steel	33 1/2¢ 5%
Chesterman's . . .	25¢ @ 25¢ 5%
Keuffel & Esser Co.:	
Favorite, Ass Skin . . .	40¢ 10¢ 50%
Favorite, Duck and Leather . .	25¢ 50¢ 25¢ 10%
Metallic and Steel, lower list, 35¢	35% 5%
Pocket, 35¢ @ 35% 5%	
Lufkins:	
Asses' Skin . . .	40¢ 10¢ 50%
Metallic . . .	30¢ 30¢ 5%
Patent Bend, Leather . . .	25¢ 50¢ 25¢ 10%
Pocket . . .	40¢ 40¢ 5%
Steel . . .	33 1/2¢ @ 35%
Wiebusch & Hilger:	
Chesterman's Metallic, No. 3ML	25%
etc.	25%
Chesterman's Steel, No. 1038L	etc.

Teeth, Harrow—

Steel Harrow Teeth, plain or headed, 3/4-inch and longer	
per 100 lb.	\$2.55 @ \$2.80

Thermometers—

Tin Case, Cabinet, Flange, Dairy, &c.	30¢ @ 35%
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Ties, Bale—Steel Wire—

Single Loop	82 1/2¢ 10%
Monitor, Cross Head, &c. 70¢ @ 2 1/2%	

Tinner's Shears, &c.—

See Shears, Tinner's, &c.

Tinware—

Stamped, Japanned and Pieced, sold very generally at net prices.

Tire Benders, Upsetters, &c.

See Benders and Upsetters, Tire.

Tools—Coopers'—

L. & I. J. White	20¢ @ 25%
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Haying—

Myers' Hay Tools	45%
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Ice Tools—

Gifford-Wood Co.	15%
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Miniature—

Smith & Hemenway Co.'s, Davidson, . doz., Nickel Plated, \$1.50	
Gold Plated	\$2.00

Saw—

Atkins' Cross Cut Saw Tools . . .	35% 5%
Simonds' Improved	33 1/2%
Simonds' Crescent	25%

Ship—

L. & I. J. White	25%
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Transom Lifters—

See Lifters, Transom.

Traps—Fly—

Balloon, Globe or Acme, doz., \$1.15 @ 1.25; gro. \$11.50 @ 12.00	
Harper, Champion or Paragon, doz., \$1.25 @ 1.40; gro. \$13.00 @ 13.50	

Game—

Imitation Oneida	75¢ @ 10%
Newhouse	45¢ @ 50%
Hawley & Norton	65%
Victor	75¢ @ 75¢ 10%
Oneida Community Jump . . .	50%
Hector	75¢ @ 75¢ 10%

Mouse and Rat—

Mouse, Wood, Choker, doz. holes, 12¢	
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Mouse, Round or Square Wire, doz. 85¢ @ 90¢	
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Marty French Rat and Mouse Traps (Genuine):	
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No. 1, Rat, . doz., \$13.25 . \$11.50 doz.	
No. 3, Rat, . doz., \$6.50 . \$5.75 doz.	
No. 3 1/2, Rat, . doz., \$5.25 . \$4.70 doz.	
No. 4, Mouse, . doz., \$3.85 . \$3.00 doz.	
No. 5, Mouse, . doz., \$3.00 . \$2.25 doz.	
Oneida Community:	
Out o' Sight, Mouse, . doz. . . .	\$0.60
Easy Set, Mouse, . doz. . . .	1.25
Easy Set, Rat, . doz. . . .	1.00
Wood Choker, Rat, . doz. holes, 12¢	
Premier Tin Choker, 5 hole, . doz. traps . . . . .	.75

Trowels—

Disston Brick and Pointing . . .	25%
Disston Plastering	20%
Disston "Standard Brand" and Garden Trowels	30%
Kohler's Steel Garden Trowels, . doz., 5 in. \$4.80; 6 in. \$6.00	
Never-Break Steel Garden Trowels, 5 in. . doz., \$6.00	
Woodrough & McParlin, Plastering .	25%

Trucks, Warehouse, &c.—

B. & L. Block Co.:	
New York Pattern	50% 10%
Western Pattern	60% 10%
Handy Trucks	doz. \$16.00
Grocery Trucks	doz. \$15.00
McKinney Trucks	each, net \$10.00
Model Stove Trucks	doz. \$18.50

Tubs, Wash—

Mfg's list, price per gross.	
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No. 0 1 2 3	
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Galvanized . \$67 \$79 \$89 \$99 10¢ 7 1/2%	
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Twine, Miscellaneous—

Flax Twine:	
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No. 9, 1/4 and 1/2-lb. Balls, 21¢ @ 23¢	
No. 12, 1/4 and 1/2-lb. Balls, 19¢ @ 21¢	
No. 18, 1/4 and 1/2-lb. Balls, 16¢ @ 18¢	
No. 24, 1/4 and 1/2-lb. Balls . . .	15 1/2¢ @ 17 1/2%

No. 36, 1/4 and 1/2-lb. Balls, 15¢ @ 17¢	
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Chalk Line, Cotton 1/4-lb. Balls	24¢ @ 29¢
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Cotton Mops, 6, 9, 12 and 15 lb. to doz.	8 1/2¢ @ 19¢
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Cotton Wrapping, 5 Balls to lb. according to quality, 13 1/2¢ @ 19¢	
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according to quality, 13 1/2¢ @ 19¢	
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1/2-lb. Balls	12 1/2¢ @ 15¢
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American 3-Ply Hemp 1 . . .	13 1/2¢ @ 16¢
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Balls	13 1/2¢ @ 16¢
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India 2-Ply Hemp, 1/4 and 1/2-lb. Balls (Spring Twine) . . .	7 1/2¢ @ 9¢
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India 3-Ply Hemp, 1-lb. Balls . . .	7 1/2¢ @ 9¢
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India 3-Ply Hemp, 1/4-lb. Balls . . .	7 1/2¢ @ 9¢
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2, 3, 4 and 5-Ply Jute, 1 1/4-lb. Balls	9¢ @ 11¢
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Mason Line, Linen, 1/2-lb. Balls 47¢	
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No. 26 1/2 Mattress, 1/4 and 1/2 lb. Balls, according to quality . . .	30¢ @ 60¢
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Wool, 3 to 6 ply . . . B 6¢; A 7 1/2¢	
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Vises—

Solid Box	50¢ 50¢ 50¢ 10¢ 5%
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Parallel—

Athol Machine Co.:	
Simpson's Adjustable	40%
Standard	40%
Amateur	25%
Columbian Hdw. Co.	40%
Fisher & Norris Double Screw, net, each, Nos. 2, \$10.50; 3, \$16.00; 4, \$20.50; 5, \$27.00	
Fulton Mach. & Vise Co.:	
Reed, Swivel	25%
Star, Solid Jaw	40%
Hollands'	40%
Machinists'	40% 40% 5%
Keystone	65% 50% 70%
Lewis Tool Co.:	
Adjustable Jaw	30%
Monarch, 50% Solid Jaw . . .	50%
Massey Vise Co.:	
Clincher	40%
Perfect, 15%; Lightning Grip . .	15%
Merrill's	20%
Millers Falls Oval Slide Pattern .	60% 10%
Parker's	20% 25%
Victor's	20% 25%
Vulcan's	40% 45%
Combination Pipe	55% 60%
Prentiss	20% 25%
Rock Island	25%
Snediker's X. L.	33 1/2%
Stephens'	33 1/2%

Saw Filers

Disston's D 3 Clamp and Guide, . doz., \$24.00, 30%; Clamps . . .	30%
Perfection Saw Clamps, . doz. .	\$4.50
Reading	60%

Wood Workers—

Fulton Mach. & Vise Co.:	
Reed	25%
Star	40%
Massey Vise Co.:	
Lightning Grip, 15%; Perfect . .	15%
Wyman & Gordon's Quick Action, 6 in., \$6.00; 9 in., \$7.00; 14 in., \$8.00	

Miscellaneous—

Holland's Combination Pipe . . .	60¢ @ 60% 5%
Massey's Quick Action Pipe . . .	40%
Parker's Combination Pipe . . .	40%
R 7 Series, 60%; 187 Series, 60% 5%; No. 870, 40%	
Rock Island Pipe	25%

Wads—Price per M.

B. E., 11 up	60¢
B. E., 9 and 10	70¢
B. E., 8	80¢
B. E., 7	80¢
P. E., 11 up	\$1.00
P. E., 9 and 10	1.25
P. E., 8	1.50
P. E., 7	1.50
Ely's B. E., 11 and larger \$1.70 @ 1.75	
Ely's P. E., 12 to 20	\$3.00 @ 3.25

Ware, Hollow—

Cast Iron, Hollow—

Store Hollow Ware:	
Enameled	45¢ 10%
Ground	50¢ 5%
Plain or Unground	60%
Country Hollow Ware, per 100 lbs . . .	\$2.75 @ \$3.00

White Enameled Ware:	
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Makin Kettles	65¢ 10%
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Covered Wares:	
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Tinned and Turned	35¢ 10%
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Enameled	45¢ 10%
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See also Pots, Glue.

Enameled—

Agate Nickel Steel Ware	33 1/2%
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Iron Clad Ware	70¢ 10%
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Lava and Volcanic, Enameled .	40¢ 10%
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Tea Kettles—

Galvanized Tea Kettles:	
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Inch 6 7 8 9	
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Back 45¢ 50¢ 55¢ 65¢	
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Steel Hollow Ware—

Avery Spiders and Griddles . . .	65¢ 55¢ 5%
Avery Kettles	60%
Porcelain	50% 50¢ 10%
Never Break Spiders and Griddles .	65% 5%

Never Break Kettles	60%
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Solid Steel Spiders and Griddles .	65% 5%
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Solid Steel Kettles	60%
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Warmers, Foot—

Pike Mfg. Co., Soapstone	40¢ @ 40% 10%
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Washboards—

Solid Zinc:	doz.
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Crescent, family size, bent frame \$4.05	
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